FOOD MANUFACTURE

Incorporating Food Industries Weekly

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UNSKILLED OPERATOR FILLS AND LINKS 170 SAUSAGES PER MINUTE

ALL IDENTICAL IN SIZE, SHAPE, APPEARANCE & WEIGHT

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The machine is simple to operate; fitted with safety devices to prevent wastage of casings and mixture, and *can easily be adapted to fill cans.*

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FILLER AND LINKER

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says -

You turn the heat on—I'll keep cool!

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Fit G.E.C. 'Fractionals' to the machines and appliances you make or use. They cost no more, yet give you the advantages of G.E.C. dependability. Available in all standard ratings, and with a full range of mountings.

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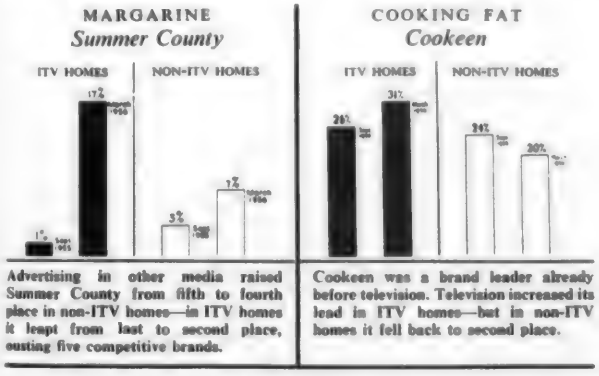
THE GENERAL ELECTRIC CO LTD., MAGNET HOUSE, KINGSWAY, LONDON, W.C.2

THIS IS THE PROVED POWER OF TELEVISION to sell Food and Drink

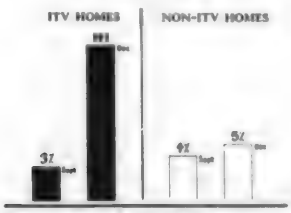
Consumers NAME ATV-advertised products first

First step to increased sales is increased brand awareness. Consumers who *name your product first* when asked "What is the first name you think of in (product group)?" will tend to *ask for your product first* at their local shop. This question was asked by an independent research organization, TV Research (Gallup Poll) Ltd., of a sample of Londoners just before Independent Television opened, and a few months later. Compare the results in ITV and non-ITV Homes:



Advertising in other media raised Summer County from fifth to fourth place in non-ITV homes—in ITV homes it leapt from last to second place, ousting five competitive brands.

Cookeen was a brand leader already before television. Television increased its lead in ITV homes—but in non-ITV homes it fell back to second place.



Sunfresh ranked eighth with consumers before TV advertising: in three months television raised it to third place, displacing five competitors.

ATV have purchased many other results of this survey, and will be glad to supply further information on request.

Consumers BUY ATV-advertised products first

These striking increases in consumer familiarity with television-advertised products are quickly reflected in higher sales. Recent research on use of Summer County Margarine in homes with and without television sets yields these remarkable index figures:

Use in homes without television - - -	100
Use in homes with television (*BBC only*) -	100
Use in homes with ITV television - -	170

While other factors may contribute to this result (ITV homes may have larger collective incomes, etc.) Van den Berghs Ltd., state that there is little doubt of the effect on Summer County sales which television advertising has had.

On a smaller scale, Quorn Specialities Ltd. of Leicester stopped all other sales promotion to measure the effect of two advertising magazine participations on Midlands ATV. The verdict? "The demand for Quorn Onion Sauce and Parsley Sauce has gathered in momentum and reached a level beyond our own optimistic estimates. The general grocery trade have placed orders by letter and telephone where previously sales resistance was indeed strong. We are entirely satisfied."

The power of television to sell Food and Drink has been *proved*. There is no equal power. And, if you will write or telephone to ATV, you will find that it costs far less than you think.

SELLS MORE—COSTS LESS!

Associated TeleVision Limited, Television House, Kingsway, London, W.C.2 (*Chancery 4488*)

London weekend and Midlands weekday programmes

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Continuous Rotary Processing through a closed, mechanically controlled system gives you substantial economies in processing time, labour and space.

Rapid and efficient heat transfer. Uniform high quality of treated material. Operation is self contained and completely hygienic. Capacity up to 8,000 lbs. per hour.

USE ROTA-PRO FOR:

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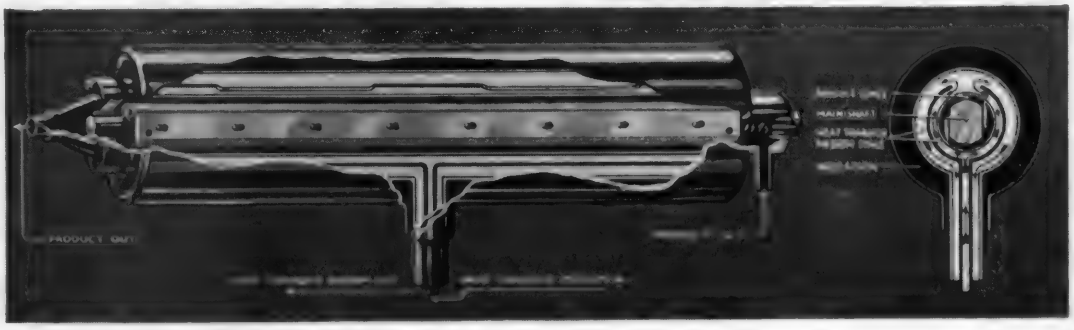
FATS · VISCOUS SOLUTIONS

HEATING · COOLING · FREEZING
COOKING · WHIPPING · CREAMING



THE CLARKE-BUILT CLOSED SYSTEM
ROTA-PRO
OF CONTINUOUS ROTARY PROCESSING

THE 'BRAIN' OF THE SYSTEM

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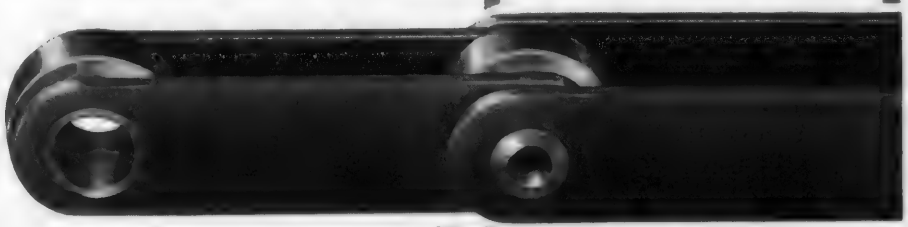
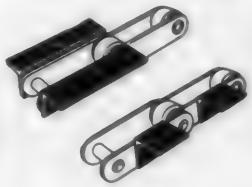
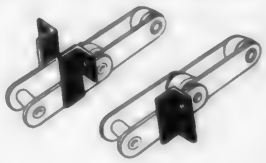


SOLID BEARING PIN CHAIN

'K' ATTACHMENTS



'F' ATTACHMENTS



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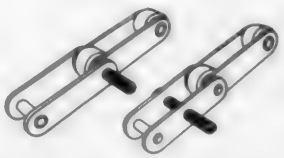

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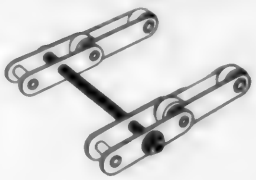

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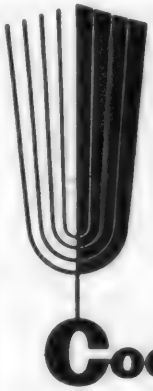

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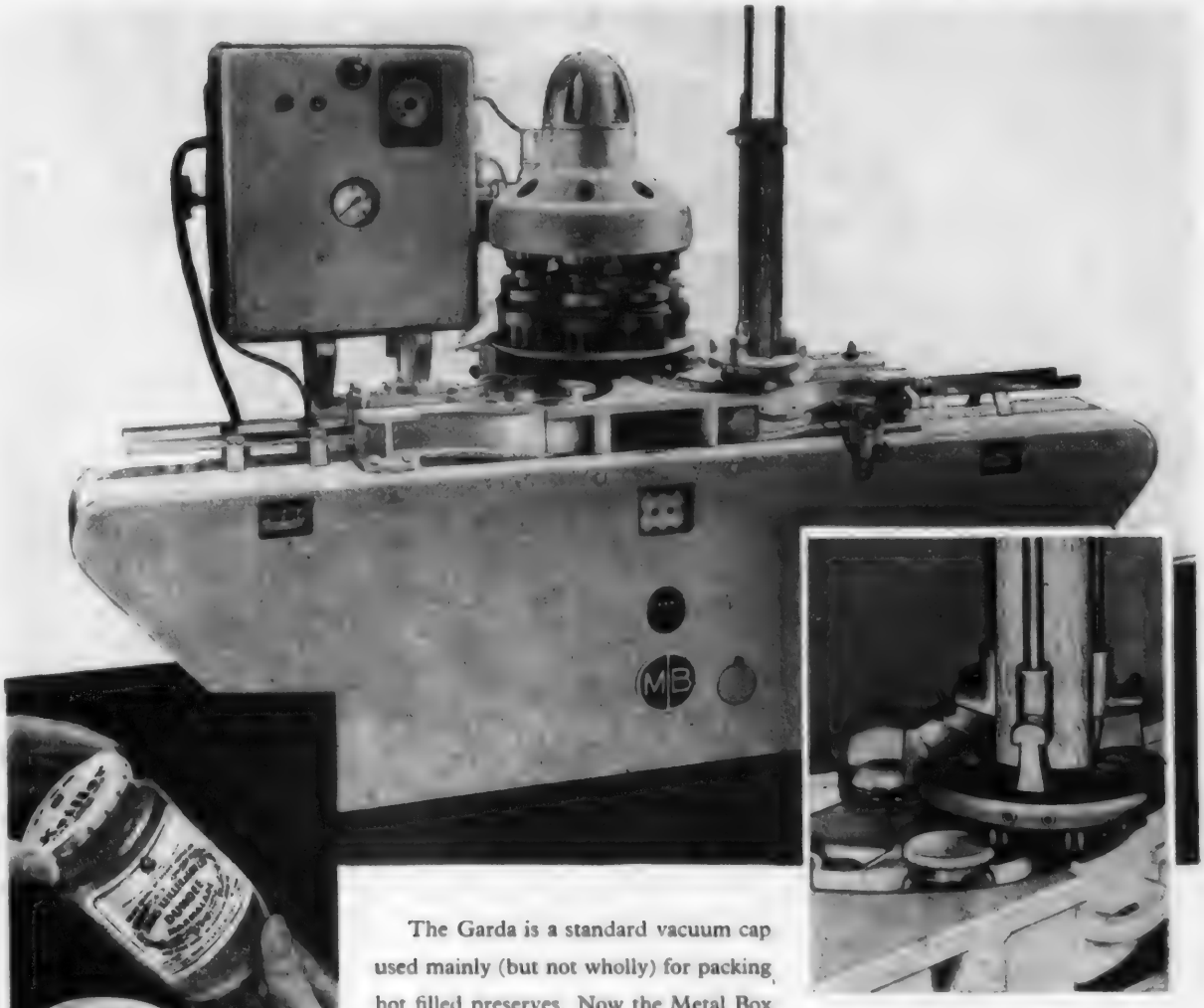

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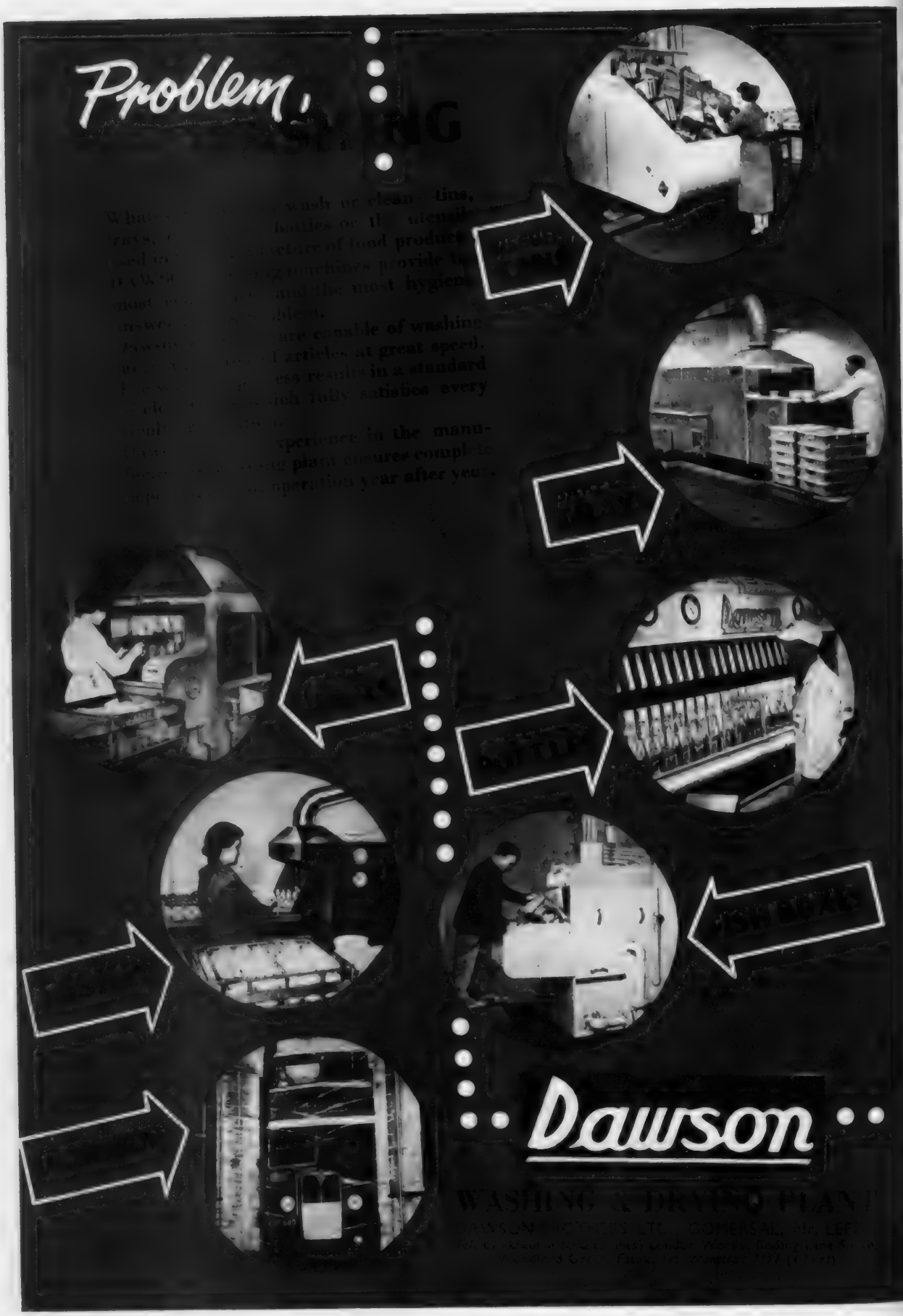
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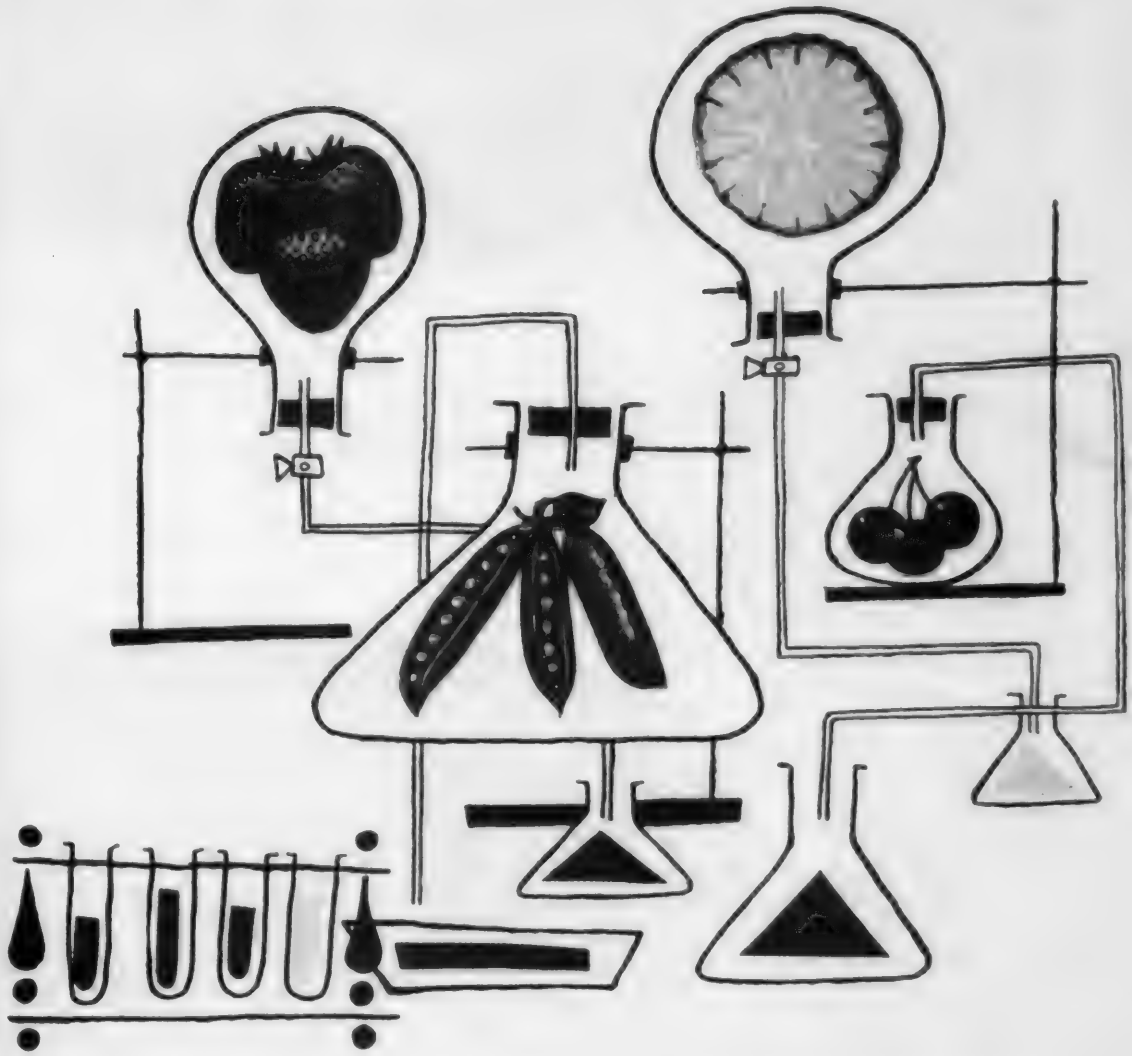

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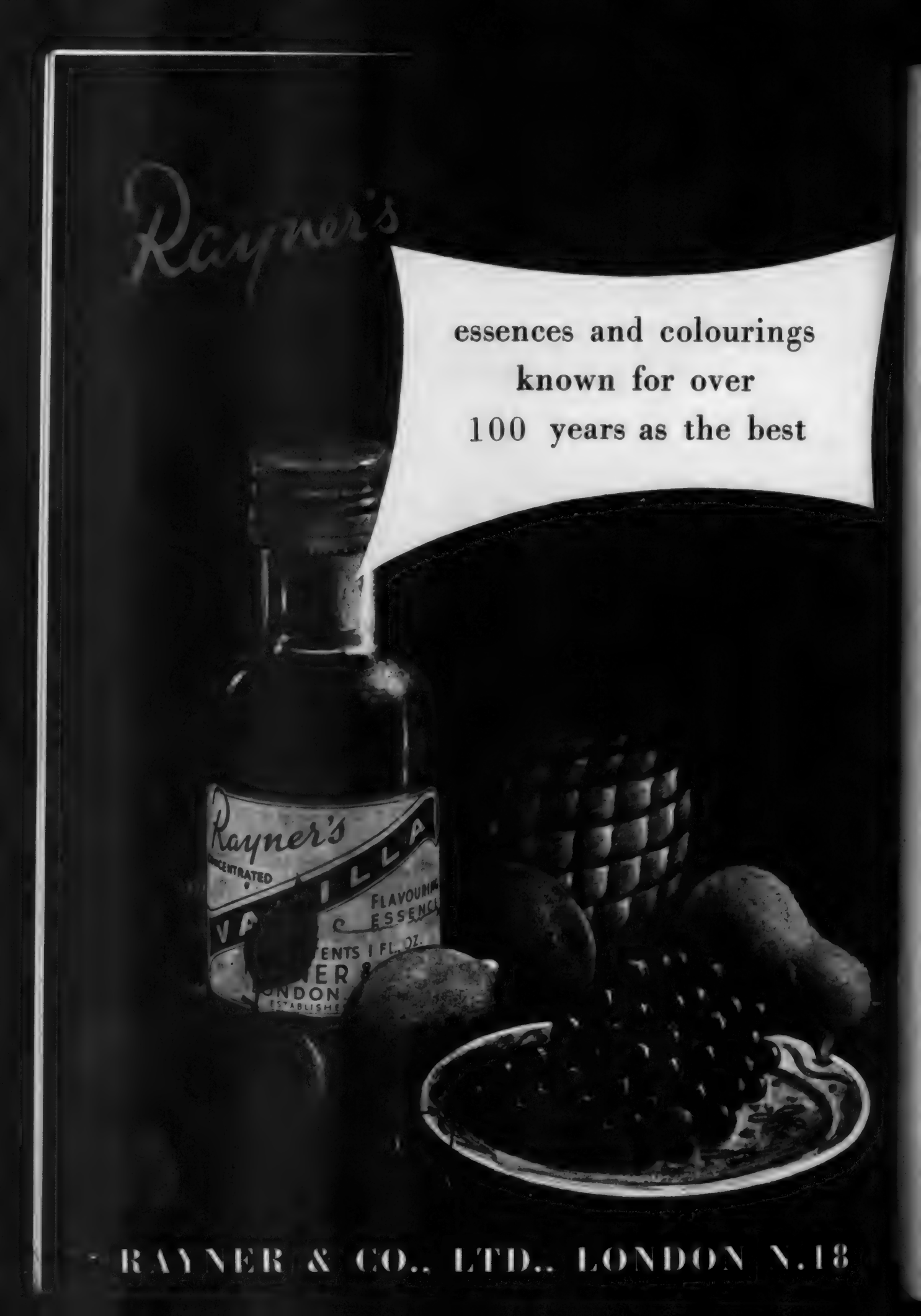

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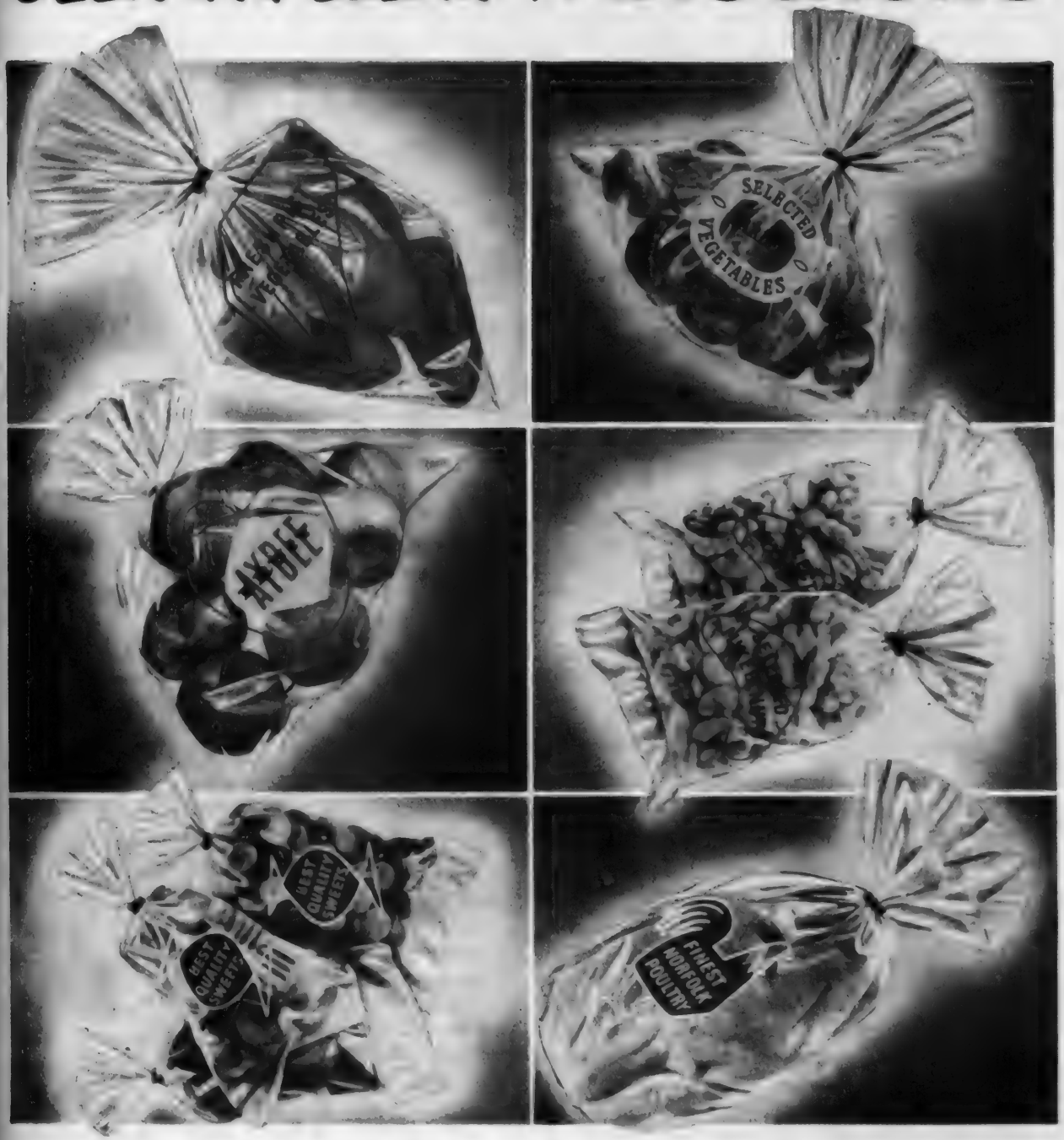

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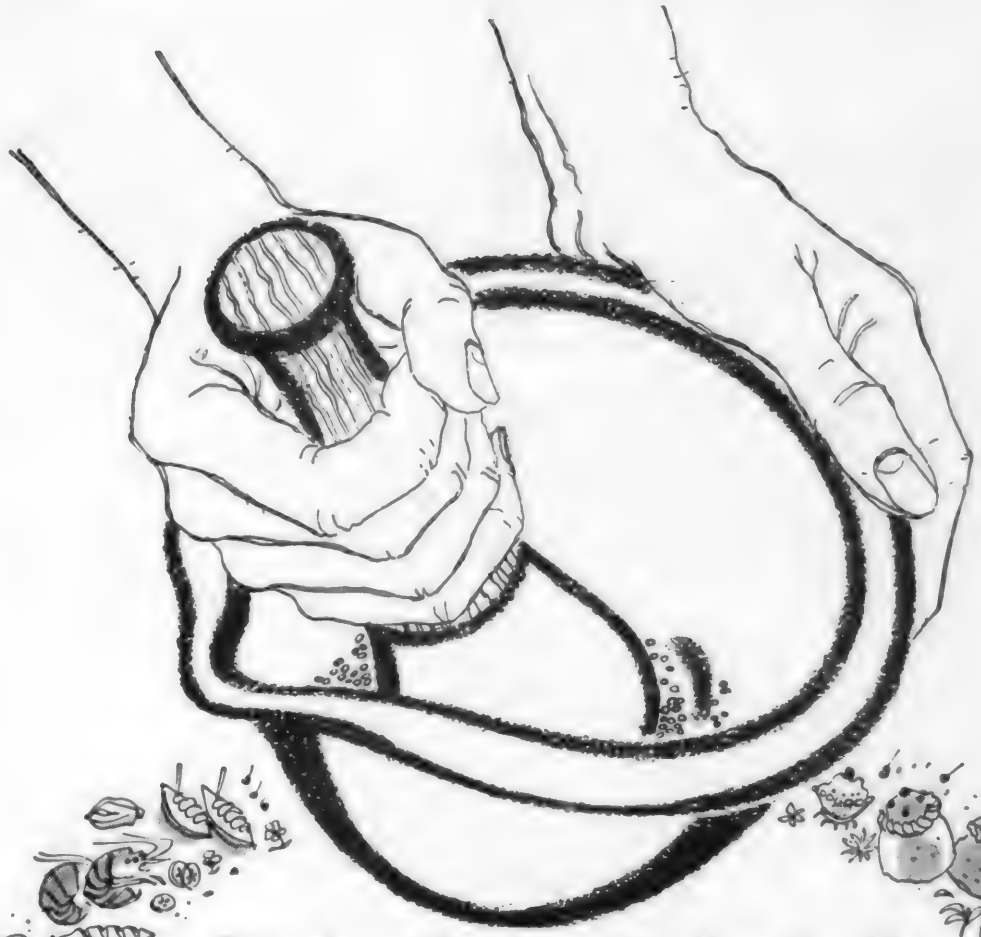

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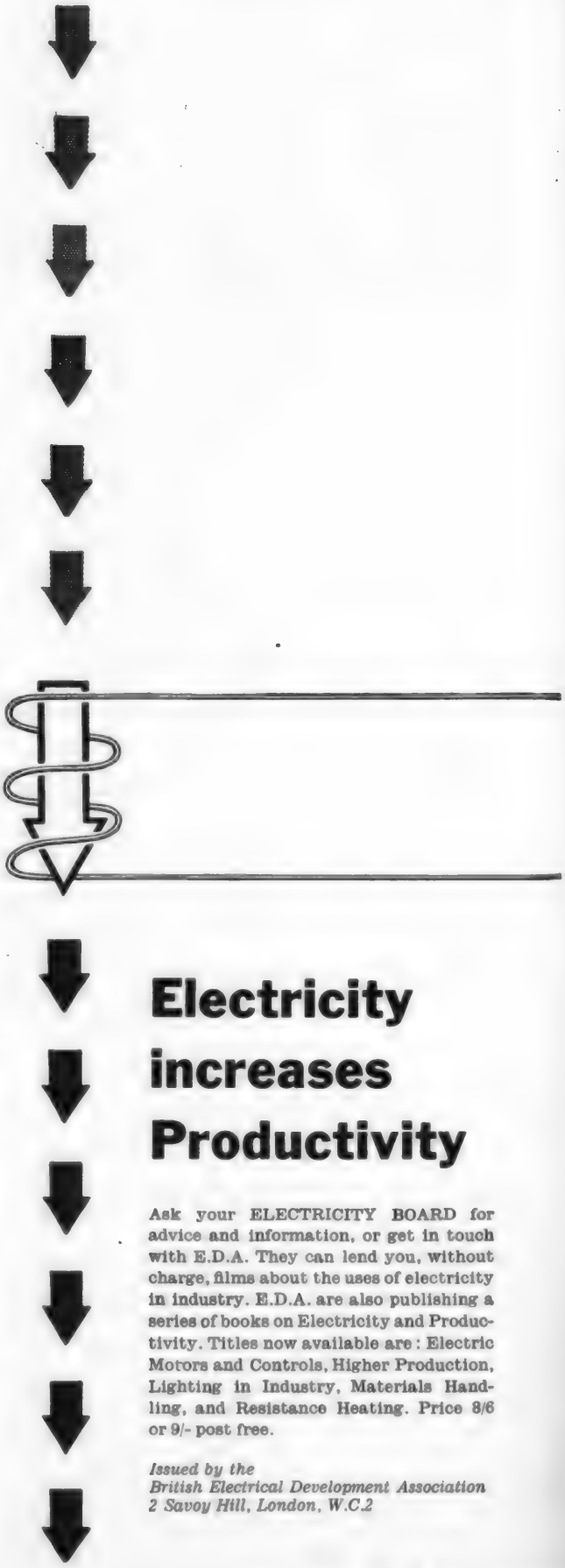

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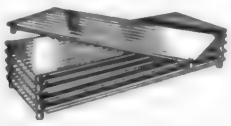

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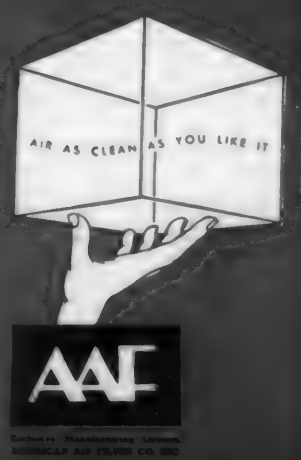

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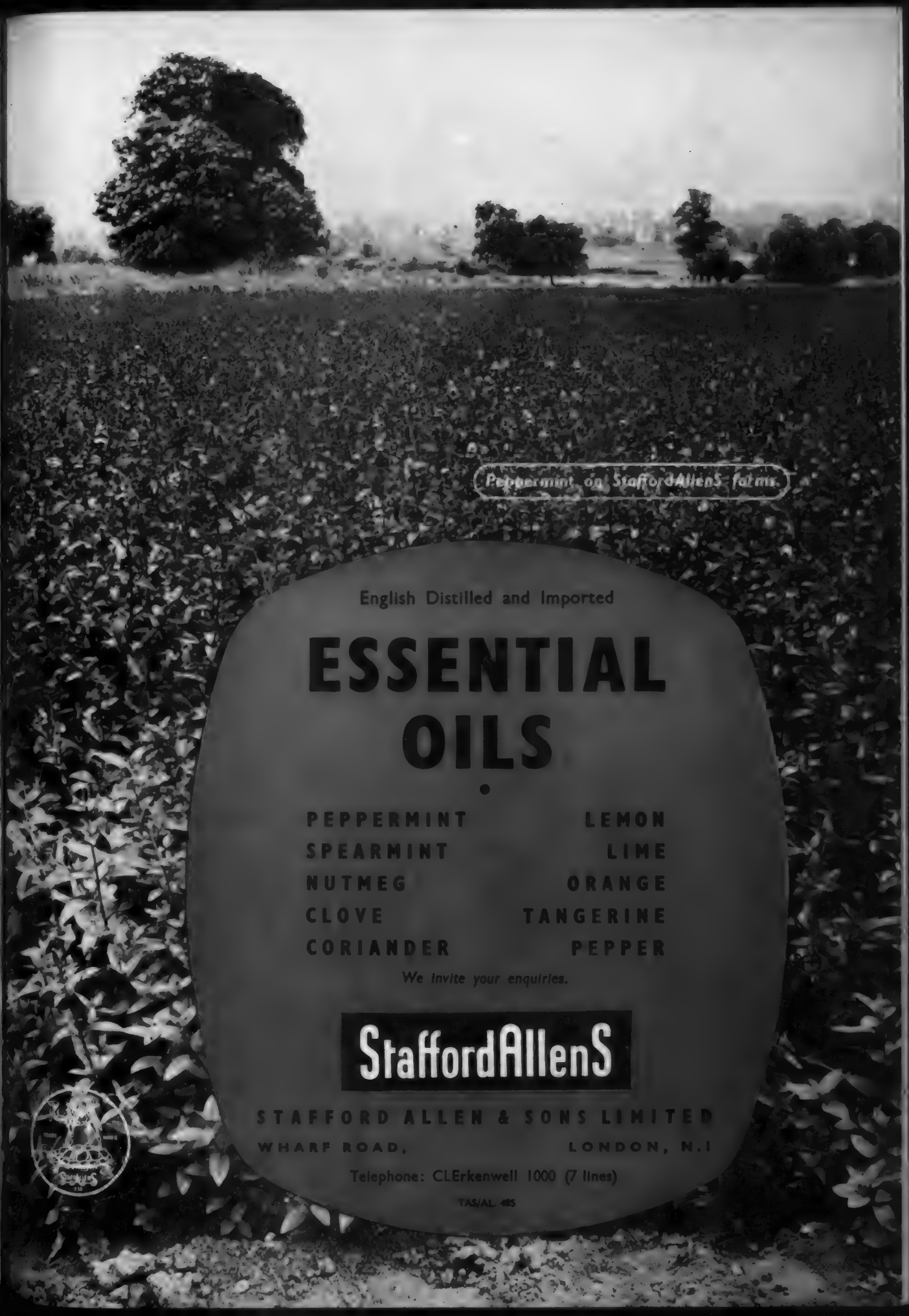

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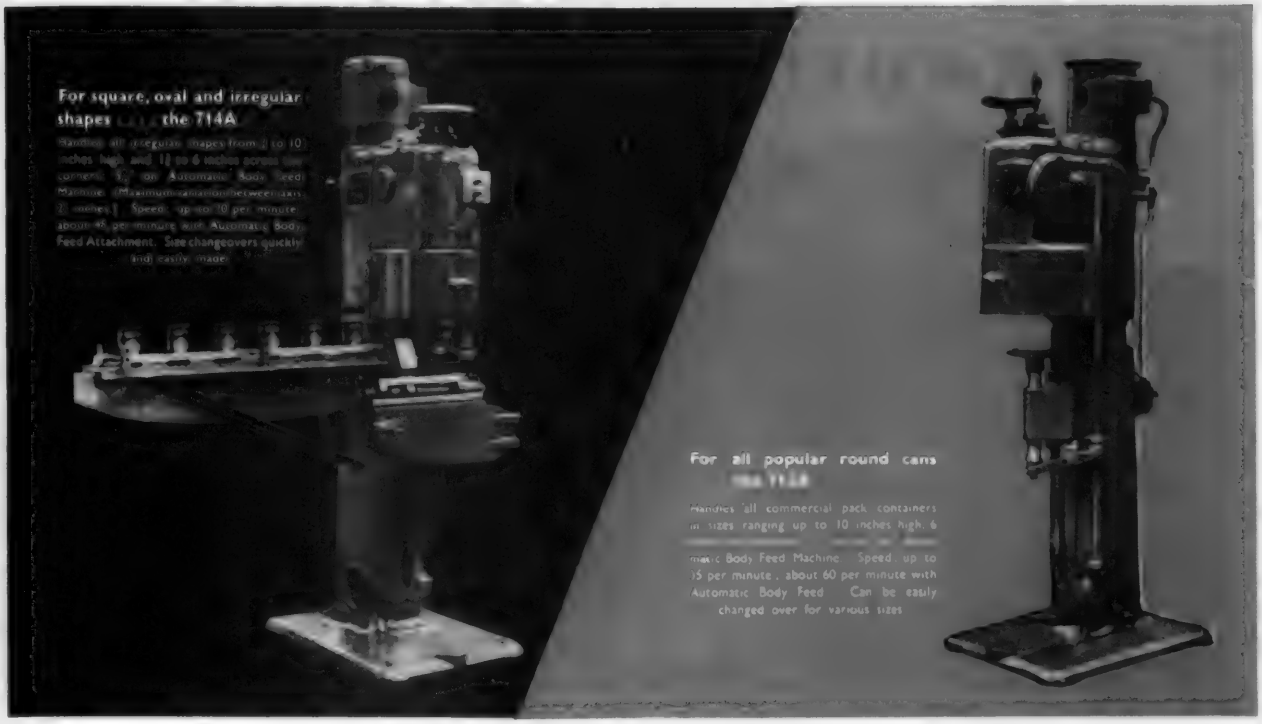

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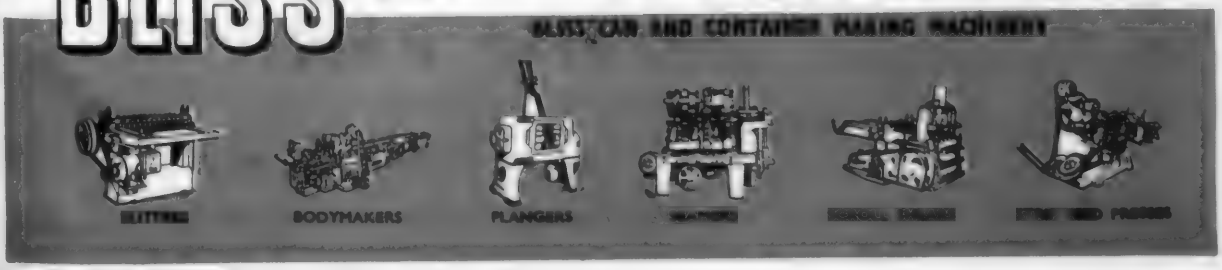
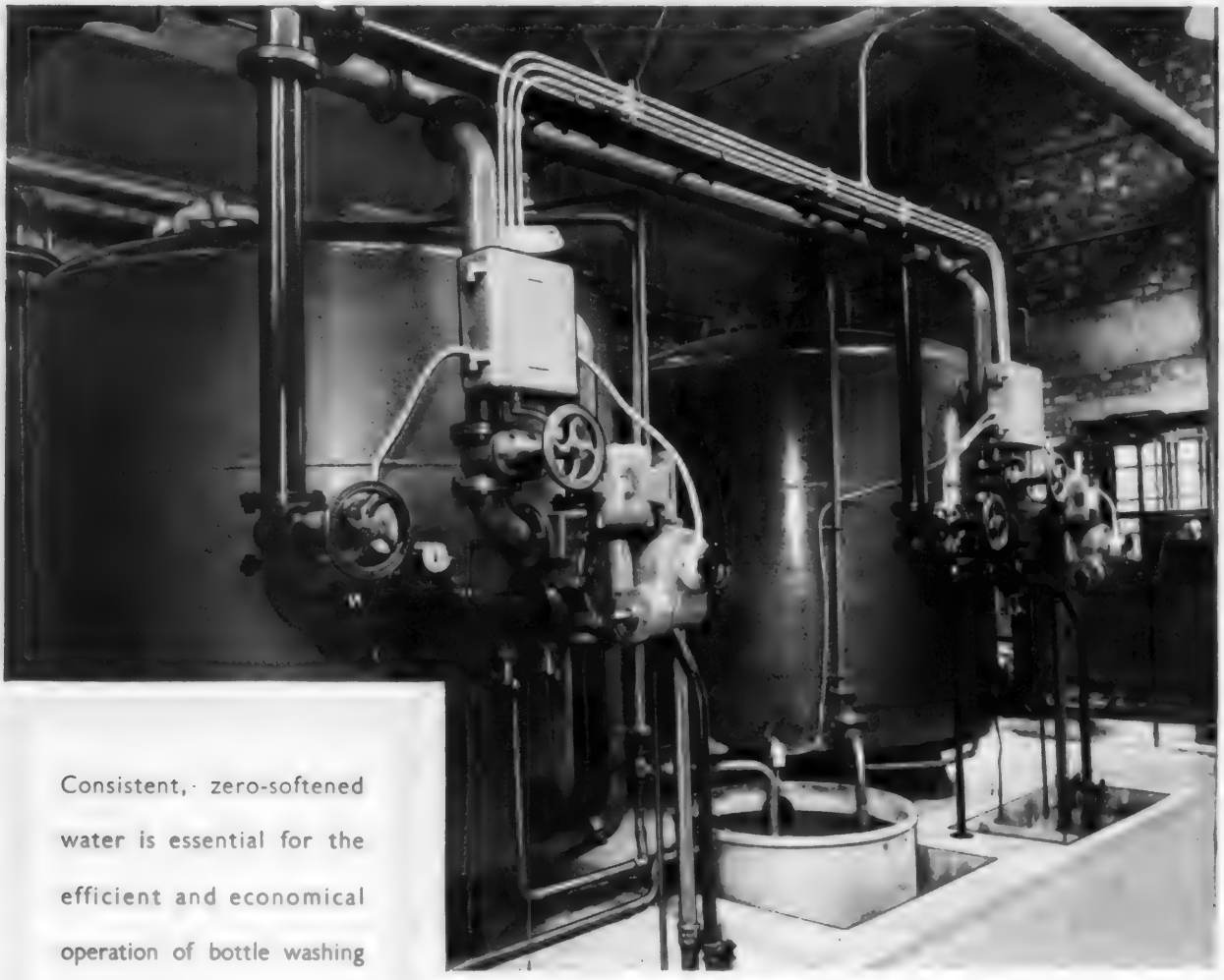
B/31

BLISS on your machine is more than a name . . . *it's a guarantee !*



PERMUTIT Water Softening Plant ensures clean, bloom-free bottles...



Consistent, zero-softened water is essential for the efficient and economical operation of bottle washing machinery and for the maintenance of the highest standards of bottle cleanliness. These are among the many reasons why Permutit Water Softening Plant is installed at this most modern dairy.

...at the South Morden Bottling Plant of EXPRESS DAIRY

For further details please write to :

THE PERMUTIT COMPANY, LIMITED,

Dept. W.L. 227, Permutit House, Gunnersbury Avenue, London, W.4. Tel : CHIswick 6431

Every day, sales and technical representatives from British Cellophane Limited are giving a range of services which help "Cellophane" film users immeasurably in the task of preserving, displaying and selling their products.

HELP FROM B.C.L. FOUR invaluable services....

1. **PACKAGING AND MERCHANDISING ADVICE** *from B.C.L. representatives. They know transparent films inside out—how they can best be used, what they will do for your product.*

2. **TECHNICAL AID** *with packaging machinery from the Service Engineers. They have at their finger-tips up-to-the-minute knowledge of wrapping machines. They can smooth out your technical troubles.*

3. **SCIENTIFIC ASSISTANCE** *from the staff of the Research and Development Division. They work to improve existing films, to develop new ones, to find answers to film-users' queries.*

4. **PACKAGE DESIGN HELP** *from artists and designers. They are specialists in creating attractive packages for all kinds of products, however awkward their shape and size.*

THESE SERVICES ARE FREELY AT YOUR DISPOSAL—WITHOUT OBLIGATION

HIGH-QUALITY CONVERSION

High-quality colour printing and bag-making for "Cellophane" film users are an integral part of the B.C.L. SERVICE.
COLODENSE LIMITED, *exponents of film printing and converting techniques, are now a wholly-owned associate of British Cellophane Limited.*

"CELLOPHANE" — the first packaging film — and the greatest!

BRITISH CELLOPHANE LIMITED

Commercial Offices: 12/13, CONDUIT STREET, LONDON W.1
Reg. Offices and Factory: BATH ROAD, BRIDGWATER, SOMERSET

"Cellophane" is the registered trade mark of British Cellophane Limited and denotes the brand of cellulose film manufactured by them

Built stronger to last longer!

COMMER 1¼ TON VAN

with long life o.h.v. chrome bore engine

- ★ Economical four-cylinder engine—ideal for arduous "stop-start" work.
- ★ Robust four-speed synchromesh gearbox.
- ★ Smooth ride suspension, hydraulically damped, designed for the load.
- ★ Powerful hydraulic brakes, safe and sure.
- ★ Full forward control for maximum manœuvrability.
- ★ All-steel body—300 cu. ft. capacity—easy to load.
- ★ Time saving sliding doors, flush fitting.
- ★ Comfortable, wide-vision driver's compartment.
- ★ Imposing prestige-building appearance—large display panels.

SEE YOUR COMMER DEALER NOW!

A ROOTES PRODUCT

COMMER CARS LTD. LUTON EXPORT DIVISION: ROOTES LTD. DEVONSHIRE HOUSE PICCADILLY LONDON W.1

For sure protection of canned foodstuffs

IT'S THE Lacquer THAT COUNTS

Yet another addition to the Coates range of Preservex Lacquers. The lacquer to guard against blown cans, can corrosion, and sulphur staining—in fact, to be recommended for all types of canning.

Coates PRESERVEX

UNIVERSAL LACQUER

COATES BROTHERS INKS LIMITED

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SERVE THE PRINTING WORLD

Gums...

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For over 100 years, we have been importing gums from the east in their natural form.

The experience we have gained, together with our modern grinding plant, enables us to maintain guaranteed standards.

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Guarantee of Purity

Automation in the bakery

And the wagon does the rest

When a Simon Bulk Flour Delivery Wagon arrives at a bakery, the driver couples the discharge outlet of the wagon with the bakery intake line. Then he engages a power take-off in the cab and sets the discharge mechanism in operation from a control panel at the rear of the vehicle. The Bulk Wagon does the rest.

Think how simple these operations are for the driver. Think how quickly the wagon discharges—its rate of 20 tons an hour means that its 14½-ton load of flour is in the bakery storage bins in 45 minutes.

Compare this quick and easy method of unloading flour with the old-fashioned way of sack delivery. Simon Bulk Flour Handling and Storage saves time, labour and money. It could do these things in your bakery. Why not write for details now?

SIMON
BULK FLOUR HANDLING AND STORAGE

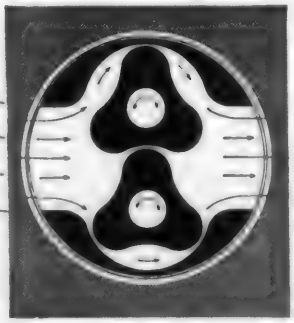
Henry Simon Limited
CHEADLE HEATH, STOCKPORT

HS 231/FS

Perfection

in Pump performance

Long, steady, reliable performance under the hardest workin g conditions is what you get with the Howard M-Type Rotary Pump. It's strong and powerful in dealing with thick and viscous liquids, yet its superior streamline action also enables it to handle even the most delicate liquids without the slightest degree of agitation. The M-Type Rotary Pump is ideal for industries handling liquid foodstuffs and chemicals, no matter how high or low their viscosity. Its all stainless steel construction and foolproof design eliminates any possibility of corrosion or contamination. Maintenance and cleaning are very simple matters and the pump casing can be jacketed for heating purposes.



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PNEUMATIC ENGINEERING CO. LTD.

There are 7 sizes of Howard M-Type Rotary Pump for duties from 150 to 20,000 gallons per hour, for heads up to 200 ft.
Please write for our very informative and well illustrated brochure.

HOWARD PNEUMATIC ENGINEERING COMPANY LIMITED

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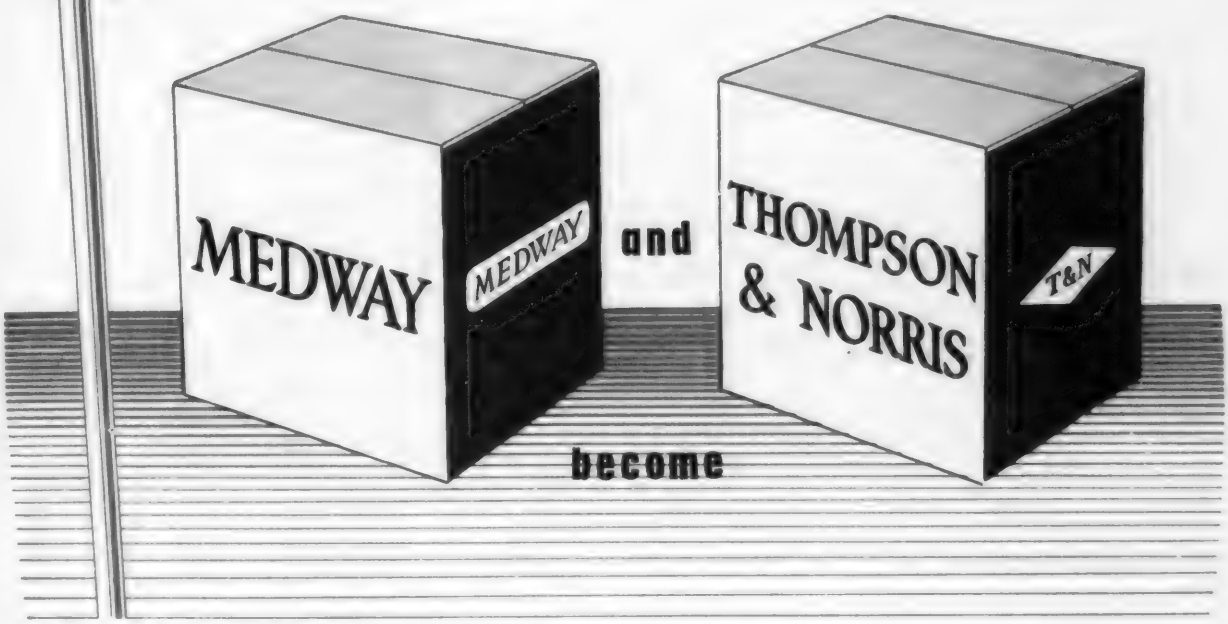
TWO BIG NAMES BECOME ONE



REED CORRUGATED CASES LTD.

IMPORTANT NEWS! Britain's two leading manufacturers of corrugated products are now one. The Medway Corrugated Paper Co. Ltd., and The Thompson & Norris Mfg. Co. Ltd., have been combined into a single company—Reed Corrugated Cases Limited.

This development will benefit industry throughout the country. Here are four good reasons:

★ *Reed* sales offices throughout the U.K. give you a complete and personal service.

★ *Reed* production capacity, with eight factories, can execute your orders with speed and efficiency.

★ *Reed* offers you the accumulated skill and technical experience of two great companies.

★ *Reed* streamlined organisation gives you top quality at competitive prices.

Reed sales offices and factories are strategically placed throughout the British Isles. The whole of our resources are available to you through our Regional Sales Offices.

REED CORRUGATED CASES LTD.
GREAT WEST ROAD · BRENTFORD · MIDDLESEX
Telephone: EALing 4555
BIRMINGHAM · CAMBRIDGE · EDINBURGH · MANCHESTER · NEW HYTHE (Maidstone)
TOVIL (Maidstone) · WARRENPOINT (Northern Ireland).

Presented with pride!

Seal your pack with " Viskrings " and establish confidence between you and your consumer. YOU can be confident that your bottling will reach the consumer perfect and intact. The CONSUMER will be confident that the contents are genuine and as expected—a fine product, perfectly presented. Seal all stoppered and screw-capped bottles with " Viskrings ". There is a " Viskring " to fit every bottle neck, available in a wide range of colours. " Viskrings " can be printed with your brand symbol. Send your container complete with primary closure to us for fitting. We will return it with samples and quotations for any quantity.

- " Viskrings " can be applied rapidly by hand—no machinery is necessary.
- They are self-adjusting.
- They prevent the blowing or riding of stoppers.
- They prevent the movement of screw caps once they are tightened.
- They afford protection for branded products and reduce pilferage and evaporation.
- CELLULOSE CLOSURES . . . Contain No Metal . . . Require No Adhesive.

for your Sales sake fit "Viskrings"

THE VISCOSE DEVELOPMENT CO. LTD.

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a HUGE Stride Forward in Container Filling Technique

Note the dial thermometers (one per pump) and the tachometer to indicate filling rate per minute and record total fillings during run.

KELLIE'S NEW AUTOMATIC STRAIGHT-LINE FILLING MACHINE

for liquids, semi-liquid and viscous products including jams, jellies, marmalades, soups, syrups, lemon curd, creams, etc.

A FEW OUTSTANDING ADVANTAGES

Infinitely variable filling rates
(according to product and type of container)
30 to 240 1 lb. containers per minute
60 to 240 ½ lb. containers per minute
30 to 120 2 lb. containers per minute
30 to 80 3 lb. containers per minute

Infinitely variable conveyor speed
Automatic continuous container feed and delivery from 30 to 240 per minute on stainless-steel-slat conveyor.

Comprehensive safety standards
Pumps and conveyor electrically interlocked (both starting and stopping). Poolproof mechanical interlocking between pumps. Full enclosure of driving mechanism and electrical controls. Smooth contouring for hygiene preservation.

Micro-regulation whilst filling
Smooth and accurate filling, non-spilling, non-aerating, micro-regulated whilst machine is running.

Infinitely variable pump delivery
136 to 544 gallons per hour from each of two pumps—operable separately, simultaneously or consecutively.

Perfect protection of products
Whole-fruit strawberries and cherries, for example, are not even bruised.

Write at once for the complete specification and learn just how much you will gain in speed, efficiency, accuracy, economy and convenience. Specify KELLIE TYPE 11FP (Patents pending).

KELLIE

The last word in Filling Machines . . . by KELLIE . . . of course

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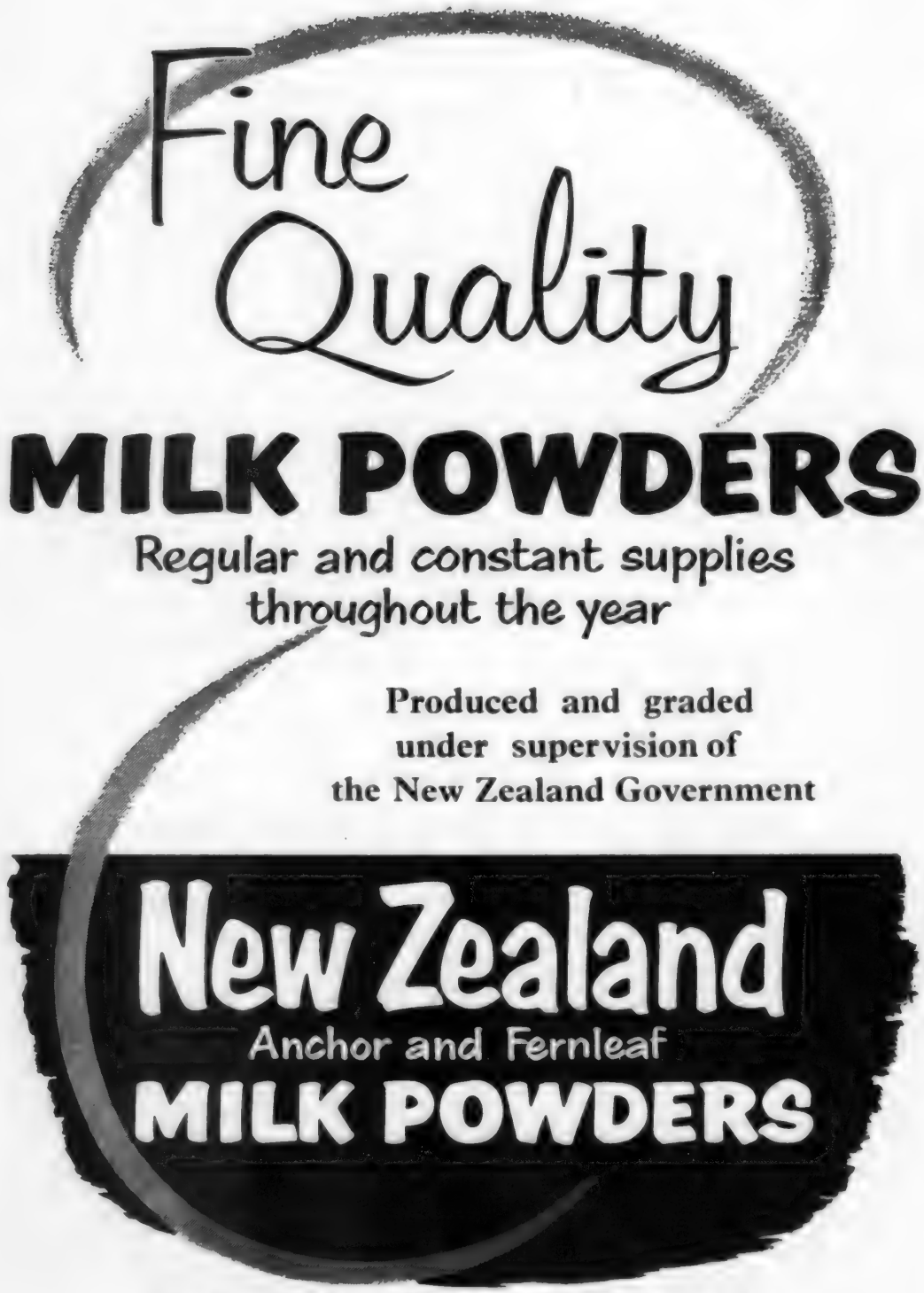
Telephone: 2819 Dundee (2 lines). Telegraphic & Cable Address: "Kellie," DUNDEE, Code, A.B.C. (5th Edn.)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MILK POWDERS
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Produced and graded under supervision of the New Zealand Government
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SEALS
Strike the perfect balance between
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R.O. Seals have it both ways. They are practical, giving a perfect hermetic seal. They are handsome, with their colourful designs and superb finish. Every seal is tailor-made to suit the individual bottle or jar screw thread rolled by the R.O. sealing machine. Made in three types—with Plain skirt, with Pilferproof perforated security band or with the new SecuRo contra-thread security band. Whichever type you need for your containers, you can be sure that the R.O. is the most distinctive closure for any product.
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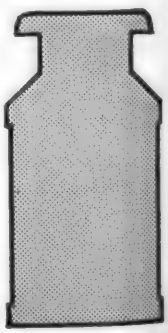
Home Produced Milk Powders,

Separated and Full Cream, Spray and Roller process.

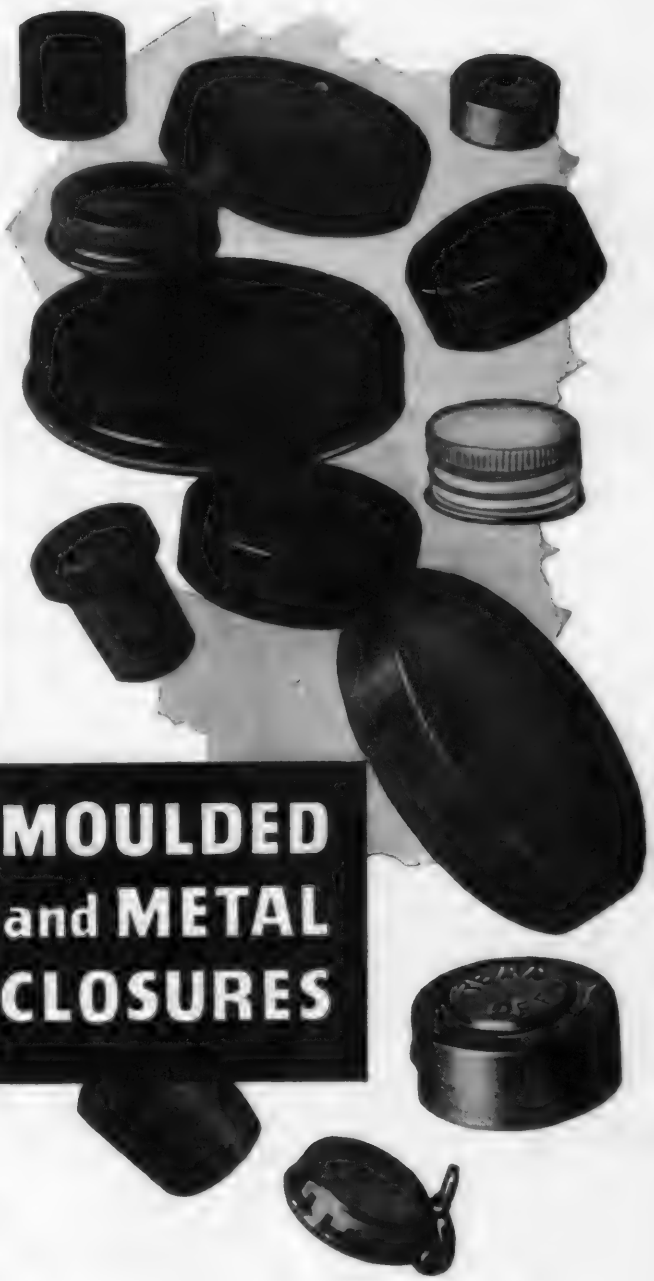
Condensed Milk (28 lb., 56 lb. & 5 cwt.) Full Cream and Skimmed.

Evaporated Milk (Gallon Cans).



Golden Glow • DMP Sales Limited • Central Buildings • Guildford • Telephone : Guildford 2345

Let's go selling with



MOULDED and METAL CLOSURES

AN efficient closure can also be attractive and vital in the sales appeal of the whole package.

We can design and supply plain, fully decorated tinplate or aluminium closures, cork stoppers and plastic caps from black to the most delicate pastel shade, with exquisite embossing.

When the contents of the container have been used and the label washed off, a distinctive closure will go on telling your story.

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CLOSURE DIVISION

UNITED GLASS BOTTLE MANUFACTURERS LTD

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"DURATAX" MIXERS provide the best results–

DURATAX Cake Mixers are unsurpassed for reliability. Well designed and of great constructional strength, each machine is GUARANTEED for 3 YEARS against faulty material and workmanship.

The DURATAX complete with Cake Beater, Wire Whisk and Dough Hook costs considerably less than any other makes. Compare our prices.
Additional attachments may be operated.

CAPACITY

10 quart - - 15 quart
20 quart - - 30 quart
60 quart - - 80 quart

YOU INVEST WHEN YOU BUY DURATAX

"Duratax" *Electric* CAKE MIXERS
CHEAPEST TO PURCHASE AND MAINTAIN

SEND FOR ILLUSTRATED LEAFLET — POST FREE

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ALMA WORKS · RASBOTTOM STREET · BOLTON · ENGLAND

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TRADE MARK

TRANSPARENT ACETATE FILM

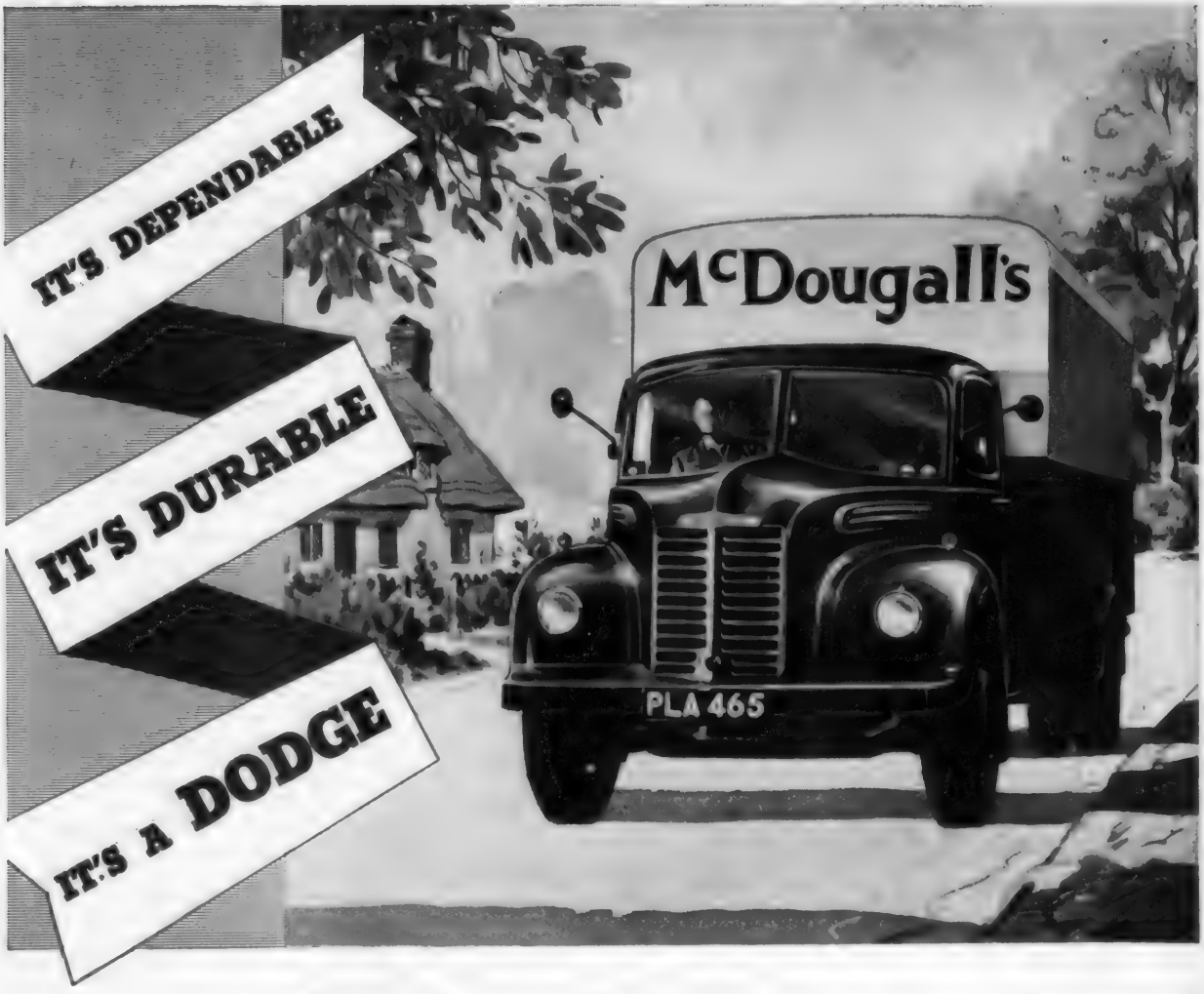
Sells on sight!

- 'Clarifoil' is a tough, crystal clear acetate film.
- Brilliant sales appeal.
- Does not wrinkle.
- Can be laminated.
- Printable in multi-colours.

Walls Pie Carton, Gleasons Currants Pack made by E. S. & A. Robinson.
Lyons Tartlet Carton made by the Metal Box Company.
Nescafe Sachet made by Brown, Bibby and Gregory, branch of the Metal Box Company.

BRITISH CELANESE LIMITED

Plastics Division, Celanese House, Hanover Square, London, W.1 Mayfair 8000

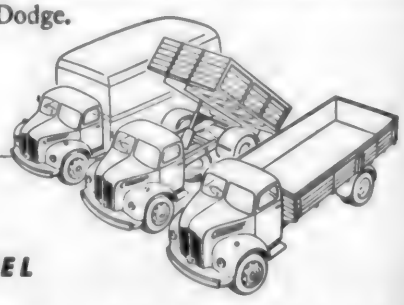


the truck you can trust

ONLY HARD FACTS count with large business concerns. Only Dodge features add up to that greater strength of purpose in design and construction necessary to cope with their rigid transport schedules.

Value-wise operators who rightly place earning power before initial cost find much in a Dodge to impress them. They see in its heavy duty, quality construction an honest-to-goodness truck devoid of 'frills' but embodying all the essentials for successful hard trucking operations. In fact, a truck designed to withstand the rigours of the toughest, roughest usage.

It will pay you to make a point of investigating the Dodge before you decide on your next truck. See for yourself why more and more users are putting their trust in Dodge.



KEW DODGE

MODELS FROM 2 TO 8 TONS • PETROL AND DIESEL

DODGE BROTHERS (BRITAIN) LIMITED · KEW · SURREY

PUT YOUR PRODUCT IN A TUBE ... AND SEE SALES RISE

METAL COLLAPSIBLE TUBES
The new idea for packaging food – opens up vast opportunities for increased sales

WHY A TUBE?

It is HANDY A tube is an applicator as well as a pack. Requires no spoon or implement.

ECONOMICAL No waste. Squeeze out just as much as required.

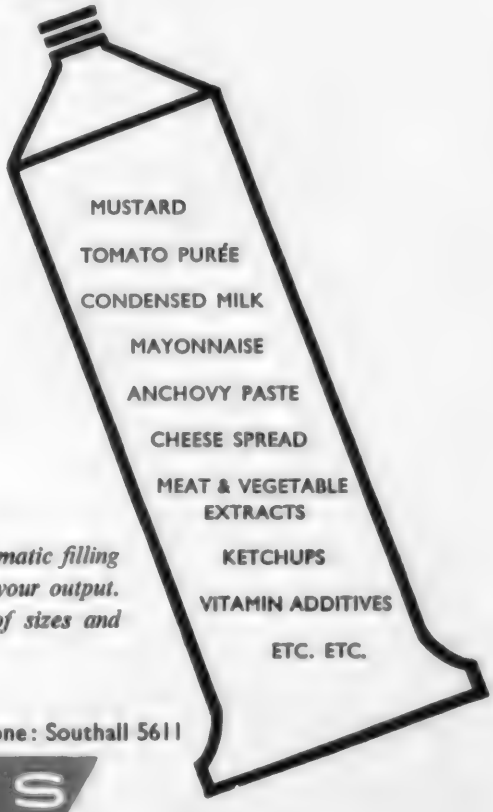
HYGIENIC Tubes protect food against drying out and contamination.

STRONG No breakages. No danger of splinters.

LIGHT Tubes give maximum contents for minimum bulk.

LOW COST The cost of tubes is inclusive of cap, liner and printed label. Lower freight charges. No damage in transit.

And it has SALES APPEAL
Tubes have eye and palate appeal — they sell more!



Our Technical Division is ready to co-operate on any tube-packaging project and work with you in developing it. Please write or telephone:

Hand or automatic filling according to your output. Wide range of sizes and capacities.

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OUR 110TH YEAR

for food-packaging in Tubes

Crofts

"RITESPEED"

GEARED MOTORS AND REDUCTION GEARS

Immediate Delivery from Production Line

to your Production Drive

Any combination of motor, gear ratio and mounting position can be supplied. Units up to 20 H.P. are available from stock, larger sizes on quick delivery. Ratios up to 82-1.

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or Phone BRADFORD 65251 for immediate attention.

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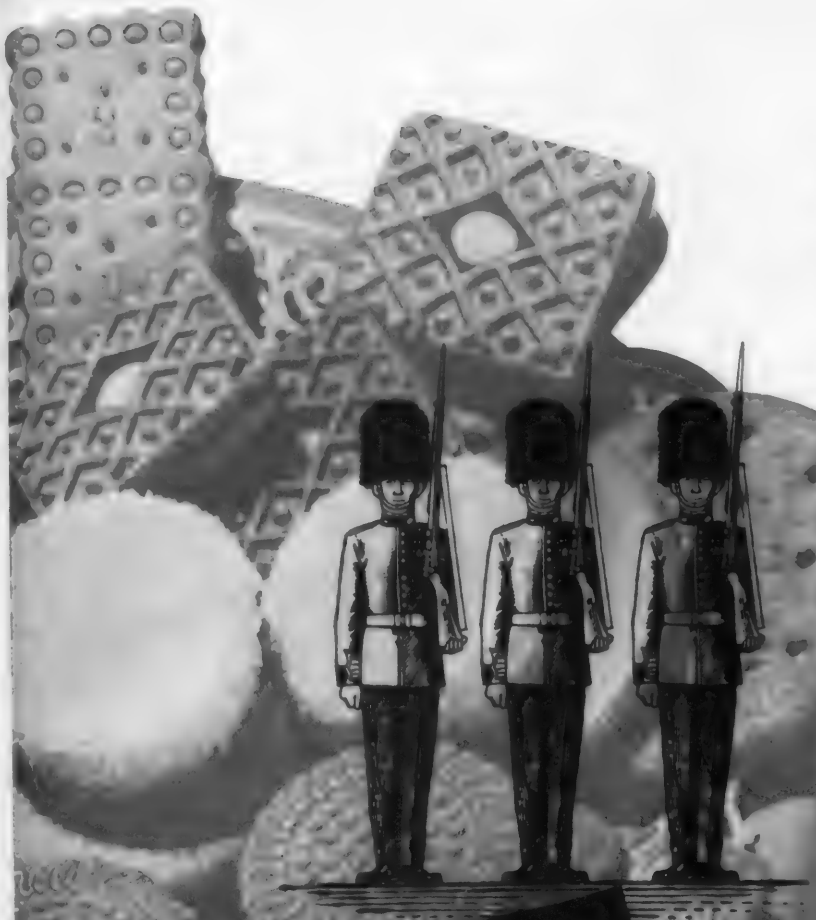
Crofts (ENGINEERS) LIMITED. BRADFORD 3. ENGLAND

PHONE 65251 (15 LINES) GRAMS - CROFTERS BRADFORD



Biscuits must have
CONSISTENCY

Depend on CBC Fats for Consistency

In a fast-flowing machine operation like biscuit making, efficiency is the order of the day; operators, plant and basic ingredients all have their place in the production plan. There can be no weak links. Fats, for instance, must be constant if the biscuit paste, or biscuit dough is to have the right consistency. This is essential if the biscuits are to maintain uniformity of quality, appearance and size, batch after batch after batch.

Very long shelf life is highly important for much of the biscuit trade particularly for export and COVO white shortening is confidently recommended. This blended fat is all-hydrogenated — a process which gives exceptional stability. Where extra flavour is of prime consideration then a quality margarine is indicated and our Marvello will impart a full, rich taste. In both cases our modern factory ensures consistency of quality and performance.

We have had much experience of fats at CBC and our knowledge is at your disposal. In addition to our standard range, we can supply special fats for particular requirements. If you want any information, at any time, just get in touch with our Sales Director.

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A Pectin for every purpose

ELPEX

The standard Apple Pectin. Completely starch-free, its high quality, clarity, and jel-making properties never vary.

NSF GRADE

A pectin of standard "Elpex" setting strength but specially prepared for the darker jams where maximum clarity is not essential.

XL GRADE

For specialised products such as Jelly marmalade. In colour and clarity, "X.L.Grade" replaces powdered pectins at less than half the cost.

and NOW!

LIQUID SLOW-SET PECTIN

Guaranteed setting temperature. Specially suited for 7's, 14's and bulk packs of jam where ordinary pectin causes caramelisation and pre-setting.

EVANS APPLE PECTINS

TWENTY-FIVE YEARS ago, William Evans & Co. pioneered the manufacture of Pectin in Great Britain. Their unique experience is freely available to jam makers through the Technical Advisory Service. Sample quantities for production testing will be sent on request.

WILLIAM EVANS & CO. (HEREFORD & DEVON) LTD., WIDEMARSH, HEREFORD

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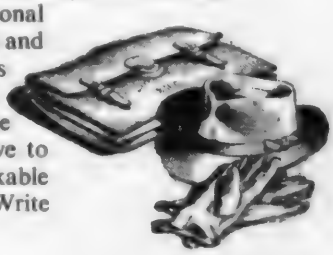
One of the
B.H.C. MULTI + GRADE QUATERNARIES

Plant sterilisation was one of the biggest headaches of the food industry. B.H.C. after years of pioneer work in their Research Laboratories found the answer—Quaternaries! This new approach to sterilising problems led to DECIQUAM which is highly active against a wide range of micro-organisms including yeasts and moulds. It has proved the biggest step forward in plant sterilising of all time. Its exceptional wetting power ensures thorough penetration into all cracks and crevices—thereby preventing the distressing occurrences which can bedevil the food manufacturer all too frequently. You can learn all you wish to know about this remarkable product by asking for a B.H.C. Technical Representative to call on you—better still let B.H.C. demonstrate the remarkable sterilising qualities of DECIQUAM in your own plant. Write or phone today.



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An aqueous solution of DECIQUAM which offers the same qualities in a more easily handled form.

'2008'
The first completely rinsable 'Quat' in the world, yet still retaining the fullest sterilising qualities.

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A new service

to food manufacturers

PURE DRIED VACUUM SALT

delivered to you

in bulk!

I.C.I.'s new air-discharge vehicles can now deliver Pure Dried Vacuum Salt to you in bulk—

—the cheapest and most hygienic method yet devised.

The salt is pumped through a pipeline straight into your storage bin or, alternatively, into your saturator.
Take advantage *now* of this new service.

IMPERIAL CHEMICAL INDUSTRIES LIMITED · LONDON, S.W.1

BS.31

ICI

TECHNICAL REPORT

BROOK MOTORS Ltd

BEARINGS

Brook was a pioneer in the standardisation of ball bearings before 1905, and more than four million have been fitted to Brook motors. Their type depends on the application and each motor is designed for its particular duty, whether light or medium, ball, roller or sleeve, thrust or loaded, and each according to its running speed and load.

Every Brook bearing is matched for size and its fitting limits are within two ten-thousandths of an inch.

Its lubricant is controlled for its duty and each bearing finally gets a running test for lift and silence in sound proofed rooms.

British Standard Drip Proof Motors

BROOK MOTORS LIMITED

HUDDERSFIELD • ENGLAND

56/8

There are hares

and hares . . .

IF SPEED is the need the choice is obvious. The same thing applies to adhesives. You should choose one made specifically for the job. A cold adhesive, of course. But that's not all. You want to be sure it's one that will increase output and decrease costs. One that will reduce stoppages and spoils. There's something more, too.

Duché & Knight make a complete range of Keystone Brand Adhesives designed solely for carton sealing. What's more, with Keystone you not only get the grade for your Trade—you also get the right formula variation for your particular machine. Consider the advantages of these adhesives:

No odour—no tainting.
Adequate penetration — 100% bond on all types of board.
Setting time matched to your machine.
Unaffected by variations of temperature and humidity.
Laboratory control of every batch ensures constant standard.
Indeed, these Keystone Adhesives give cartons a seal of excellence.

There's a **KEYSTONE** grade for every trade

KA 40 5-100

Not only right for your Trade—but also right for your MACHINE!

DUCHE & KNIGHT LTD.
LONDON, E.16 Tel.: ALBert Dock 1414

"Keystone" is the registered trade mark of all Duché & Knight Glues and Adhesives.

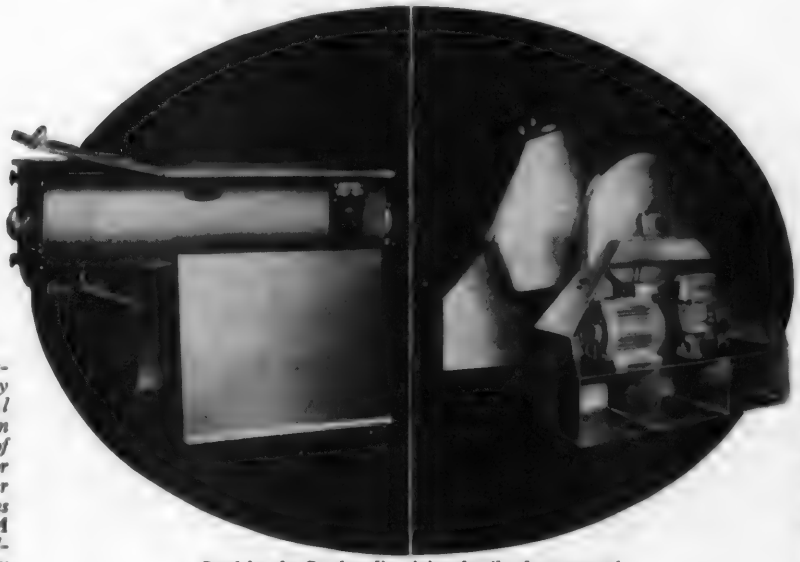
Blending aspirin or mixing food?...

Varied indeed are the materials that can be processed with Gardner machines. From plastics to rubber solutions, custard powders to man-made wood, paints to manures, wet or dry, powders or pastes, granules or flakes, they can all be mixed, sifted, ground or dried with a machine from Gardners vast range of standard or special equipments.

Whatever material you are handling it will pay you to consult Gardners about the best way to process it. They will experiment with samples of your own materials and supply a complete report. Their vast experience and "know how" will ensure that the process works perfectly before you order the machine.

GARDNERS *blend them better*

of Gloucester



The Gardner Horizontal Mixer

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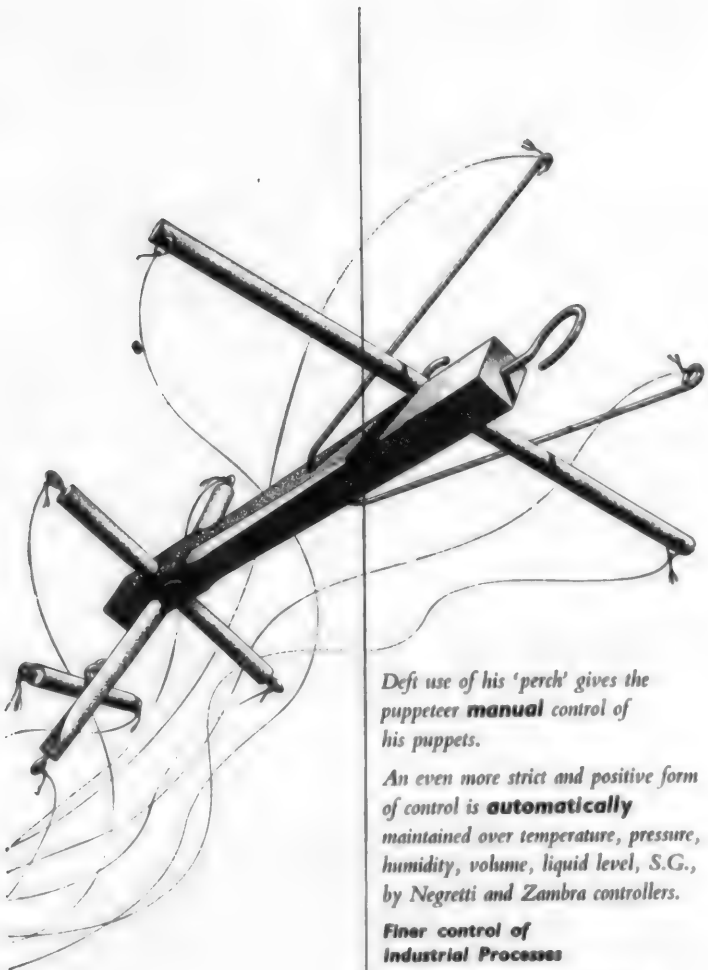

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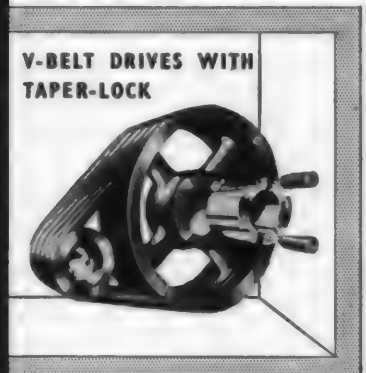

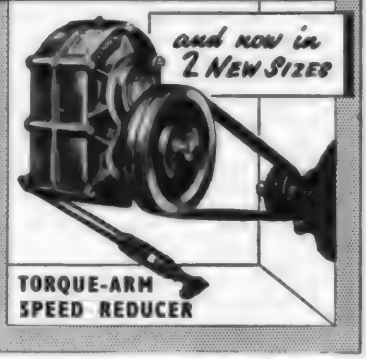

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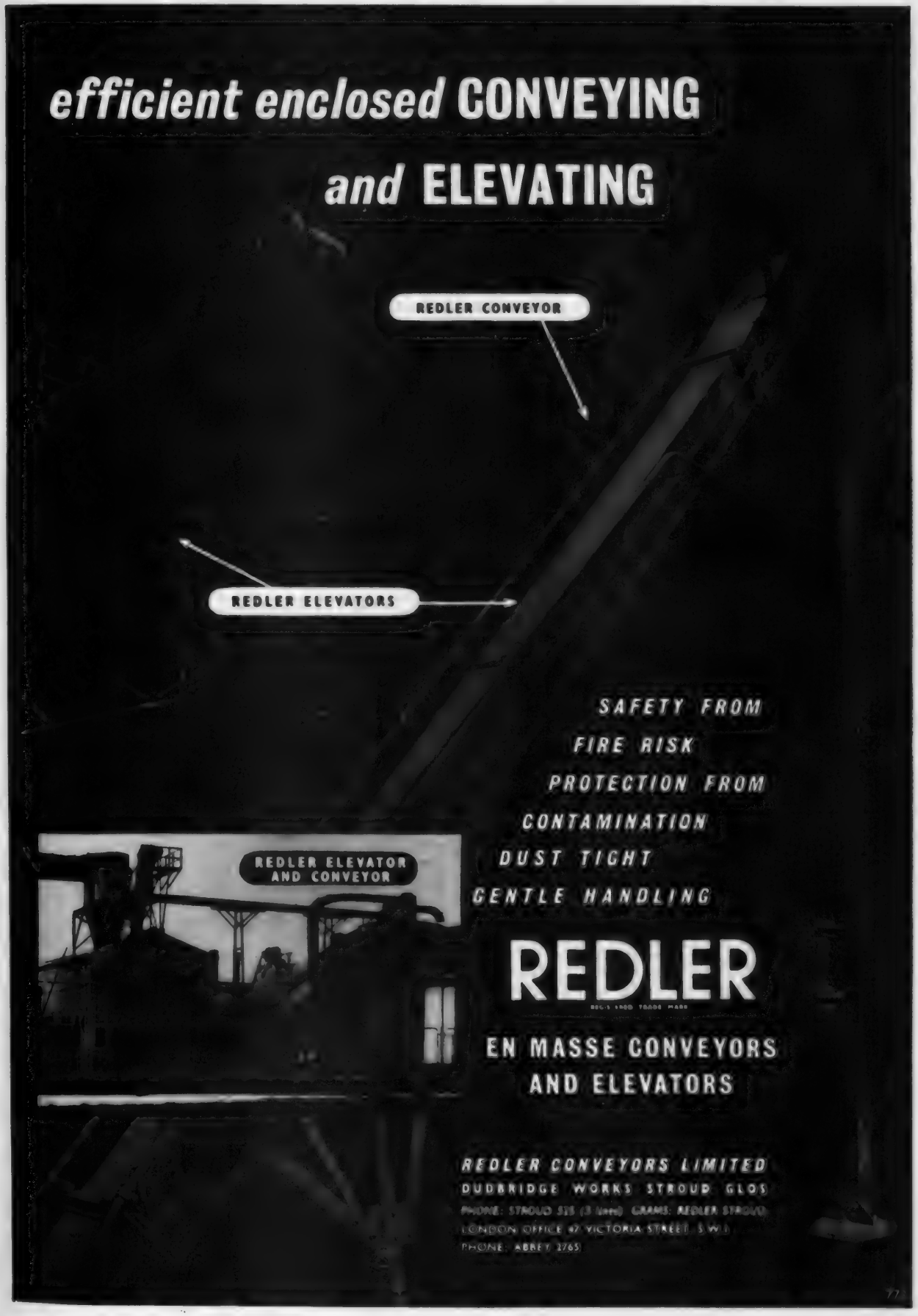

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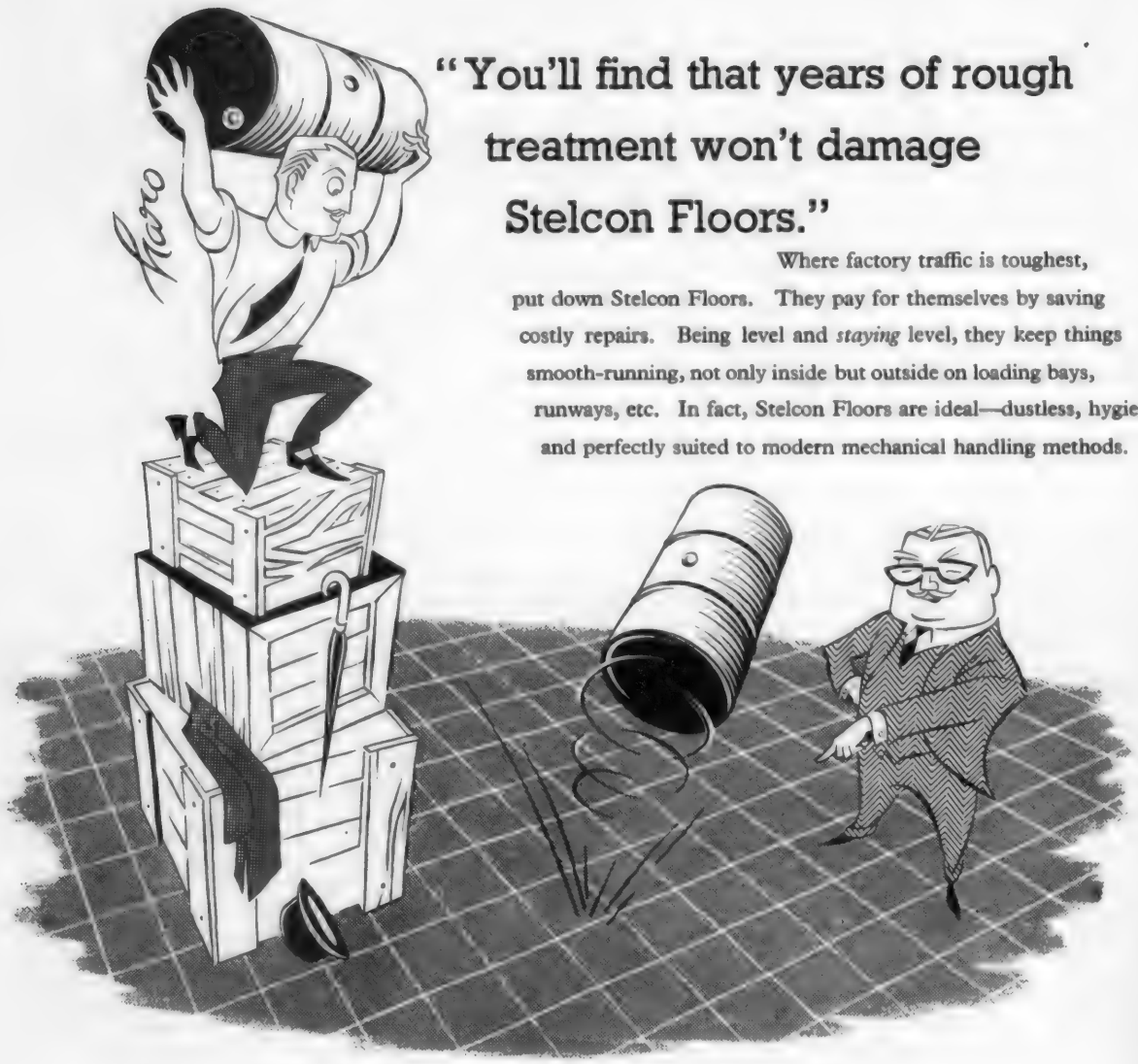

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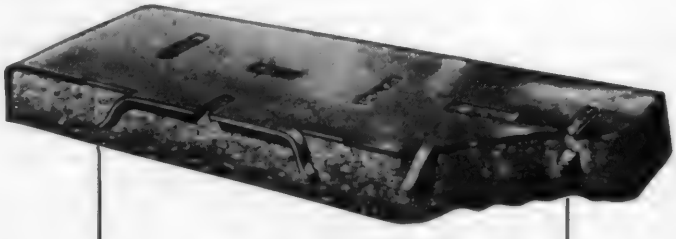

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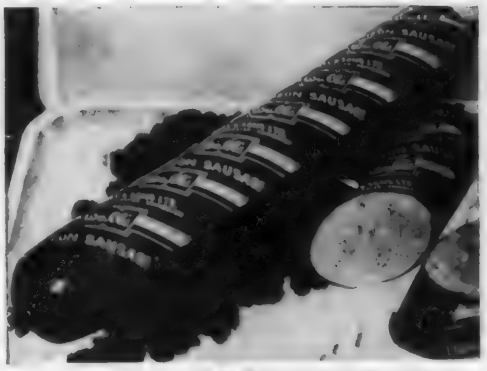

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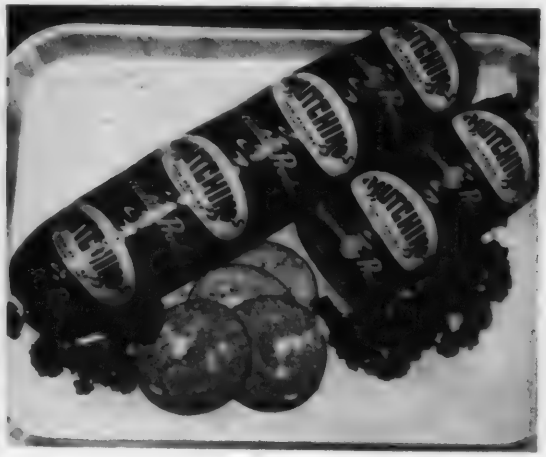

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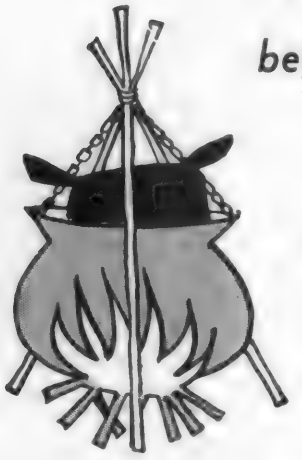
If you handle bulk quantities

which journey upstairs for weighing



before bustling through the mixers

blblpping through the boilers

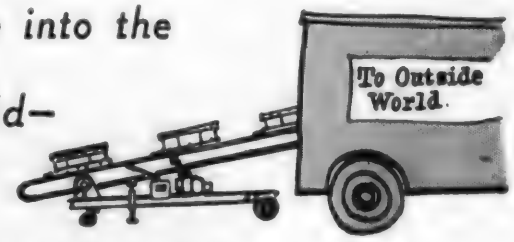
ambling through the cooling tunnel

waltzing around the filler

titivating in enrobers only to be

labelled and borne into the

melee of the outside world—



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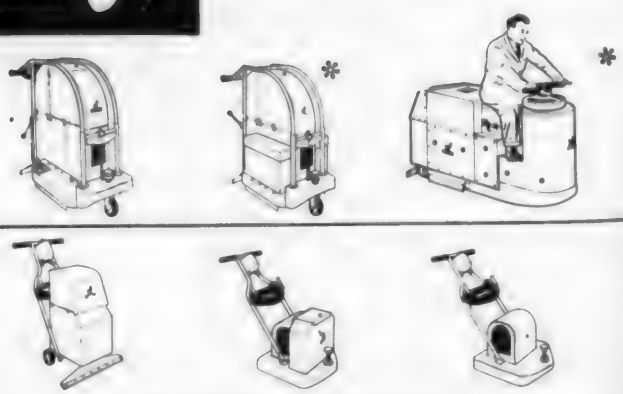

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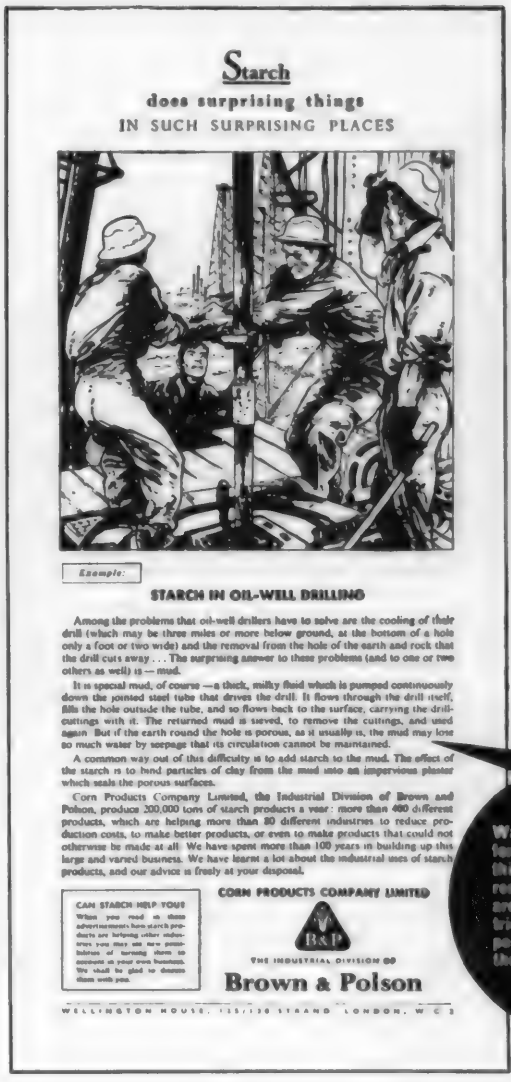
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Example:
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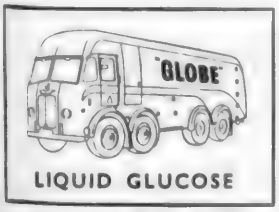

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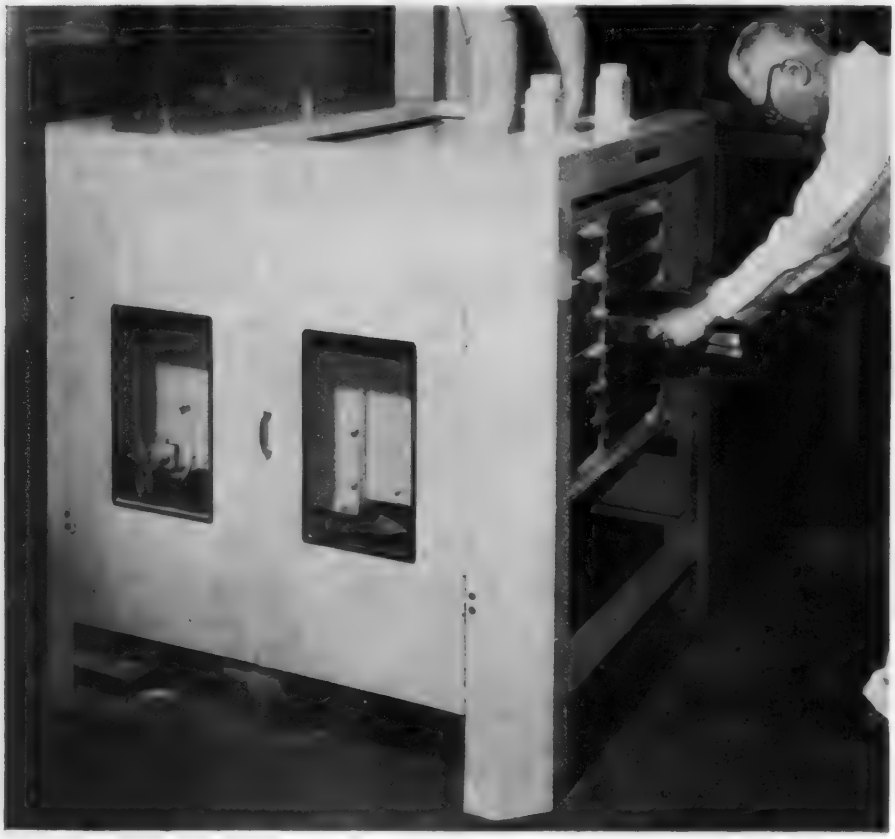

The Simon Junior Sifter has grown to be a big name in the food and confectionery world. This less-than-four-feet-square machine is now screening, grading and sifting flour, cocoa, starch, icing sugar, etc., in plants all over the country. The persuasive rotary motion of the horizontal sieves gives a gentle but positive separation of powders and granular materials, with throughputs up to three tons per hour. Its totally enclosed metal body means absolutely dust-free operation. Interchangeable aluminium trays and easily removed "drawer-type" sieves add to Junior's efficiency and simplicity.

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- Takes up little floor space.
- Easily changed internal flow for different separations.
- Simple to install and maintain.
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Products handled include:

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- **Custard Powder**
- **Moulding Starch**
- **Starch & Dextrines**
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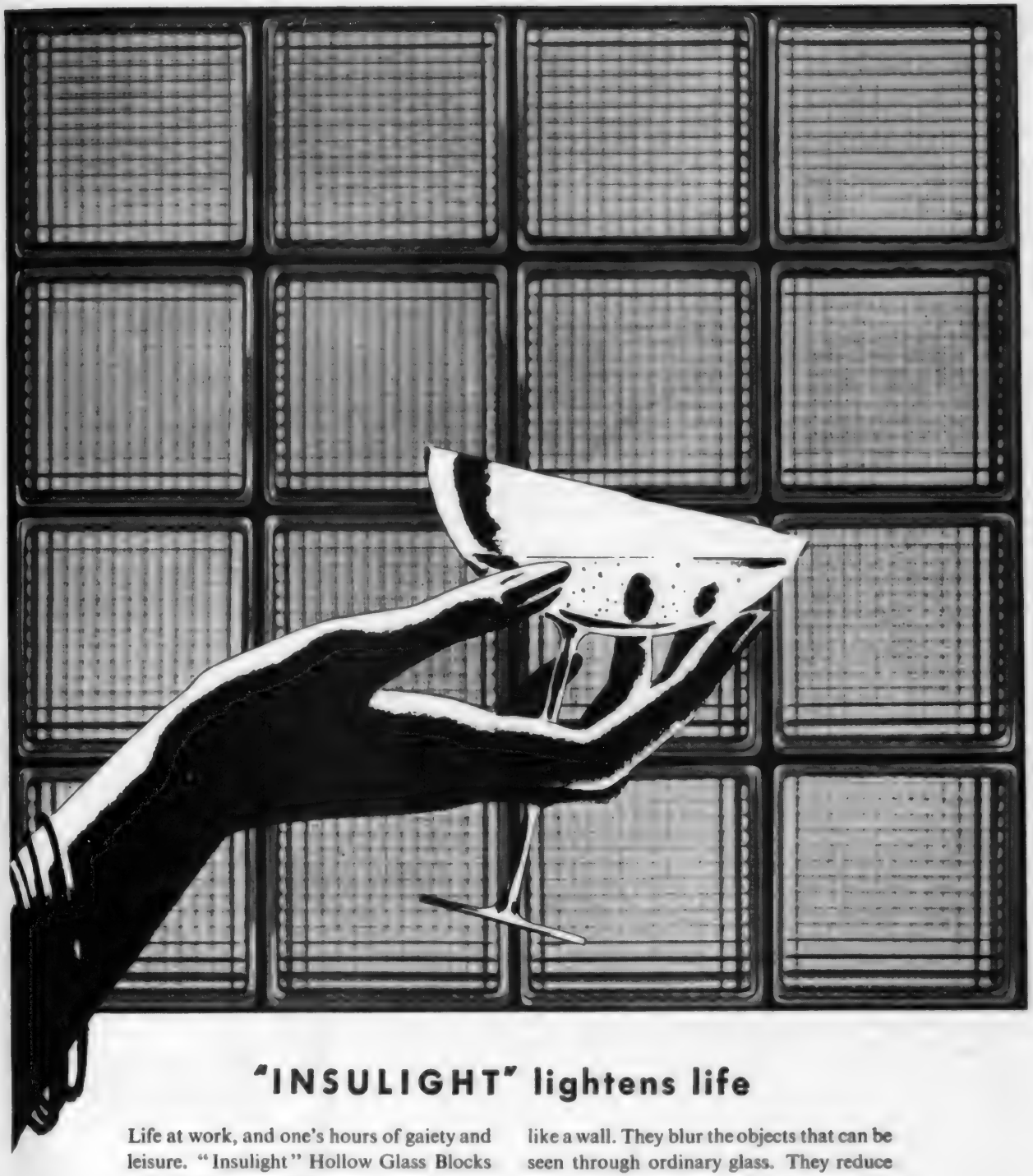

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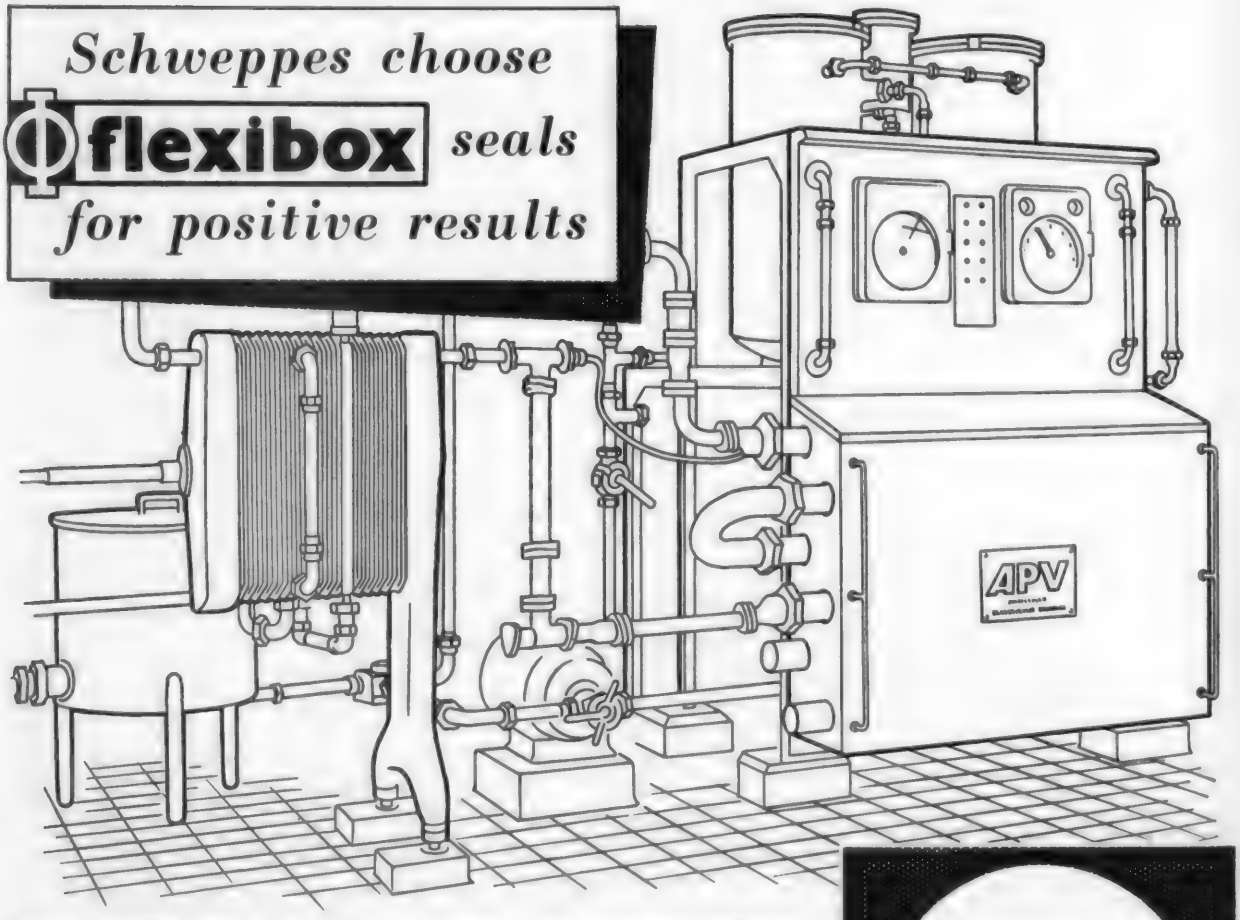
Schweppes choose **flexibox** *seals for positive results*



The plant shown here is the APV Juice De-aerator and Pasteuriser belonging to Schweppes Ltd. Some years ago, this well-known food processing company fitted Flexibox mechanical seals to the rotary pumps used in conjunction with this plant in order to achieve leak-free operation. The Chief Engineer now writes: 'The Flexibox seals were fitted following trouble with the ordinary type of gland packing. The ordinary packing required tightening every two or three days to prevent leakage and within a short time became so dry—because of the low lubrication value of fruit juice and sugar syrup—that the rate of wear on the shaft was very heavy. The Flexibox seals have given satisfactory service over a period of two or three years.

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FOOD MANUFACTURE

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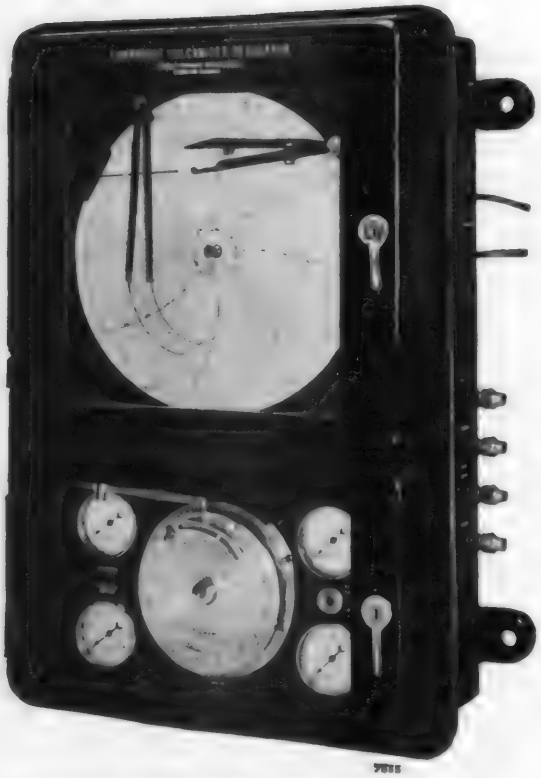

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FOOD MANUFACTURE

Vol. XXXI, No. 5 May 1, 1956

A new chapter in preservation

A JOURNEY we reported briefly last month (p. 68) came to an end in Smithfield on April 10 when representatives of the meat trade assembled at the National College of Food Technology to inspect carcases of *Acronized* beef which had been killed in New Zealand 53 days previously. Not only were the carcases inspected by the butchers and journalists. Later in the nearby Butchers' Hall these adventurous folk ate sandwiches of *Acronized* beef—and very good it seemed too.

The whole demonstration, from New Zealand to Smithfield, was organised by Lederle Laboratories Division of American Cyanamid Co., the company which discovered and make Aureomycin, the antibiotic which is the basis of the *Acronizing* process. The beef was sprayed with a very dilute solution of the preservative containing no more than 10 p.p.m. of active antibiotic. It was then chilled and transported in this condition in the *Gothic*. On arrival here it was compared with untreated control carcases. As reported in the January 1956, FOOD MANUFACTURE (p. 4) another method of treatment is to infuse the antibiotic into meat. The preservative acts by retarding the growth of spoilage bacteria and in this sense its effect is similar to that of antibiotics used therapeutically. It is specifically intended to be used as an adjunct to refrigeration and not as a substitute. It is claimed to double the keeping time of meat, at a cost so low that it should not increase its retail price. However, it cannot disguise spoiled meat so there is no risk of food sophistication.

Acronize is a fine golden powder containing additives such as citric acid and salt which help to stabilise the Aureomycin during food processing. It has the great advantage of being destroyed by cooking, so there is little chance of any antibiotic remaining in cooked food. Even if the meat were eaten raw, it is calculated that a person would have to eat a ton of freshly sprayed lean meat at one sitting before receiving a therapeutic dose of Aureomycin.

These are the facts as publicised by American Cyanamid and confirmed in several details by the Department of Scientific and Industrial Research. However, the Ministry of Health is being commendably cautious and has so far refused to authorise the use of antibiotics for food preservation under any circumstances. Cyanamid Products Ltd., the U.K. end of American Cyanamid, have formally applied to the Ministry for permission to use antibiotics for poultry preservation. In this move they are no doubt encouraged by the fact that on November 30, 1955 the U.S. Food and Drug Administration authorised to use of Aureomycin for the preservation of poultry; the limit being fixed at 7 p.p.m. D.S.I.R. scientists are now experimenting with antibiotics for fish preservation. They are testing the claim that Aureomycin (or chlortetracyline) added to ice will preserve fish for from 7-10 days longer than usual. If these trials prove successful enough to encourage the Ministry of Health to revise the present regulations, the food industry will be presented with one of the greatest advances in preservation since refrigeration.

Who pays for food research?

ELSEWHERE IN this issue we summarise the results of another year of food research carried out with the support of the Department of Scientific and Industrial Research. The pattern is the same as in previous years. Research on meat, fish, fruit and agricultural produce is largely in the hands of the Food Investigation Organisation of the D.S.I.R. Baking, milling, fruit and vegetable canning and manufactured and preserved foods are the responsibilities of the four co-operative research associations.

Over the years expenditure on food research has steadily risen. To take, for instance, the past three years, we find that expenditure has increased by more than 40%, from about £380,000 in 1952-53 to nearly £555,000 in 1954-55. The lion's share is allocated to the F.I.O. Last year they spent £373,000. Of the £181,285 spent by the four research associations, about £64,000 was given by the state, the remainder being contributed by industry. Thus, food manufacturers probably paid directly no more than £120,000, or a little more than one-fifth of the total cost of state-aided food research. The biggest contribution was made by the flour millers; the other three associations are more generously helped by the state. What is significant is that the heavy costs of meat, fish and fruit research are wholly borne by the state.

Less butter, more vegetable oils

INFORMED GUESSWORK has necessarily been used extensively for recent estimates of world production of oils and fats before the war and during the years 1948-55. The estimates were made by the Food and Agricultural Organisation. They were made after a detailed review of information available in F.A.O. records and from other official and non-official publications.

Special problems were encountered, particularly as only the U.S.A. systematically reports national production of oils and fats. Most of the information is derived from data on crop production, exports, livestock slaughter or the numbers of animals on farms. In some countries there is a substantial output of vegetable oils for family or local use, of which no statistical surveys of any kind have been made. In many countries only the commercial production of animal fats is reported. Calculations for the estimates are frequently based on data on livestock slaughter, but here again, many countries do not report slaughterings on farms or in small slaughterhouses, while some countries do not even provide statistics on commercial slaughter. Changes in livestock numbers were used as the basis for the F.A.O. calculations in these cases.

A higher output of liquid edible oils (particularly soya bean and cottonseed oils), animal fats (lard and tallow), and coconut and palm oils is the principal trend indicated in the estimates. Butter output at 3,320 thousand metric tons remains well below the pre-war level of 3,500 thousand metric tons. The total world production of fats and oils in 1955 (excluding the U.S.S.R.) is placed at 24·3 million metric tons—about 16% more than the average for 1948-50 and 27% more than in 1934-38. Production of liquid edible oils has increased by nearly one-half since pre-war days while higher supplies of tallow, the major soap fat, have freed large quantities of coconut, palm, palm-kernel and whale oil for use in food products. Today there is a considerably higher ratio of edible to inedible vegetable oil output which, says F.A.O., more than offsets the decline in butter supplies.

Consumption figures have been derived by adding or subtracting the balance of imports or exports to the indigenous production estimate. They show that today, in spite of large population increases, world consumption is slightly higher at an average of 10·3 kg. per person than the 1934-38 average of 9·8 kg. per person. The main increase in consumption—from 7·4 to 11 kg.—has been in the South American countries. European consumption, at 20·4 kg., is only very slightly higher than before the war, while in North America the consumption per person of 29 kg., although it remains the highest in the world, is slightly lower than the 1934-38 average. African and Asian per head consumptions, at 5 and 5·2 kg. respectively, remain the world's lowest. However, in spite of striking rises in populations in both these areas, the consumption per head has risen slightly in Asia and has been maintained in Africa.

For full details, readers should consult a comprehensive 24-page article in the *Monthly Bulletin of Agricultural Economics and Statistics* (1956, **5** (2) 1-24), available from H.M.S.O.

Re-equipment policy

"IT HAS been said that Great Britain knew how to build great industries but never learned how to rebuild them," said Mr. R. G. Sutherin in a paper to the American Society of Bakery Engineers at their recent annual meeting, and warned his countrymen that a sound programme of equipment replacement is an essential function of management.

Mr. Sutherin, whose paper was called "Timing of new equipment for highest profits," suggests that, subject to particular conditions, bakers should calculate the amount to be originally invested in a business as one-third of the total annual sales expected, and the amount that should continue to be invested as one-sixth of the annual sales. Particular circumstances must be considered when expansion becomes necessary. The present building and equipment must be evaluated: what can be re-used? How much labour will be needed? What will be the cost per unit and the pounds per man-hour, and so on. For example one company, wishing to increase production, found that at 80 loaves per min. the pounds per employee would be 500 per hr. At 90 loaves it would increase to 560 but at 100 loaves it went down to 490 because of the additional labour required. Thus their most profitable return was 90 loaves per min.

The most common problem is timing the purchase of single machines. Generally speaking a machine is a good investment if it will pay for itself in 3 years, particularly if that saving can come from direct labour. Hence, assuming one worker costs $4,000 a year, a $12,000 machine replacing one man will pay for itself in 3 years. Sometimes economies can be effected by buying additional machines. For example, a pan greaser at $3,000 and a bread de-panner at $6,000 will, by themselves, still require man-power to handle the pans, but with an extra $15,000 for a connecting conveyor, 2 men are saved.

The cost of a machine includes many factors: power consumption, labour, insurance, maintenance, etc., so that it may be more economical to buy new machines which are easier to keep clean, or which save materials, such as pan greasers which spread

a thinner film of oil or ovens with fuel-saving heating systems.

A tremendous source of profit in the bakery industry, said Mr. Sutherin, lies in controlling dough losses. A divider will save up to 3% of the dough. Moisture retention, by reducing the bake-out and cooling loss by only 1%, will save 3,000 lb. per week on a 4,000 lb. per hr. output.

Revealing eyes

A SEARCHING gaze into the eyes of dead fish will reveal whether or not they have been frozen, reports R. M. Love of the Torry Research Station. Armed by this knowledge housewives who have been discomfited by the battery of blank, hypnotic stares from a fish stall will confidently be able to stare back, gleaning something of the subject's history in the process.

Describing his findings in the *Journal of the Science of Food and Agriculture*, Mr. Love tells how experiments had shown that when fish were stored in melting ice the water that trickled over the eyes caused turbidity in the outer part of the lens (the cortex), a phenomenon which could be used to gauge the length of time the fish had been stored under these conditions. During the investigation it was noticed that if fish were frozen, the centre of the lens (the medulla) became a dense white, an effect which was often visible without removing the lens from the eye. Experiments were made to see if freezing was invariably accompanied by this opacity so that a simple test for market use could be developed.

The investigations showed that provided cod or haddock have not been stored for more than 16 to 18 days in ice it is easy to tell whether they have been frozen by dissecting and examining the eye lenses. If the fish has been stored in ice before freezing the limit will be more than 18 days; if more than half the stowage was after thawing, it may be slightly less than 16 days. While the length of stowage in ice cannot be assessed by examining the turbidity in the eye, some differentiation between "very fresh" and "stale" is possible. The fish must be frozen to about −4·8° or lower before the medulla whitens. The only condition which prevents whitening is the removal of water from the medulla when the fish are packed in dry salt. Even this treatment does not completely clarify a medulla which was frozen before salting.

Unfortunately the usefulness of the phenomenon is limited by the fact that freezing is often carried out on fillets rather than on whole fish. A more practical test for fish freshness—using tetrazolium test papers—is described in our summary of the D.S.I.R. report on p. 179.

Better sterilised milk

STERILISED MILK is usually not sterile, and therefore may spoil if it is stored under unsuitable conditions. During the summer months spoilage of sterilised milk is more frequent, and dairymen sometimes endeavour to overcome this by increasing the intensity of the heat treatment. There is a limit to this because the greater the intensity of treatment, the browner, and more unacceptable, the milk becomes.

A means of overcoming this problem was described recently by Dr. L. F. L. Clegg of the National Institute for Research in Dairying in a talk to the Society of Dairy Technology meeting in Bournville. It is to sterilise the milk at ultra high temperatures for very short times. At these high temperatures the heat has more effect on the resistant spores of bacteria than on the colour and flavour of the milk. Unfortunately such adjustments of treatment cannot be made on existing plant which cannot already withstand the high temperatures (275°-300°F.) or operate at such short times (1-2 sec.).

While plant now exists which can produce sterile milk in this way the full advantages of the process cannot be realised until it has been found possible to fill the sterile milk aseptically into sterile containers. Attempts have been made to do this but so far without any great success. The N.I.R.D. have made a start on this problem, which will take several years to solve.

The cream on pasteurised milk is apt to become "bitty" during hot weather, giving a flaky appearance on the top of a cup of tea, because of a harmless bacterium, *Bacillus cereus*, which survives the normal heat treatment. The only known method of suppressing this bacterium in pasteurised milk is for it to be kept below 50°F. before delivery to the consumer and below 60°F. in the consumer's household.

Preserved ginger

IMPORTERS OF preserved ginger have welcomed the recent proposals put forward by the Hong Kong Exporters' Association to ensure that ginger shipped from the Colony should be of an acceptable quality. Fully qualified surveyors are to inspect consignments before shipment with reference to approved standards and the Association's seal will then be placed on certified casks.

Surprisingly little is known about the confection preserved ginger, formed by preserving the spice with sugar, in spite of a history dating back to the 13th century. A summary of the published information on the subject by E. Brown in the quarterly journal of the Colonial Products Laboratory (*Colonial Plant and Animal Products* 1955, **5** (2)) shows that this is sparse and scattered and, except in very

recent times, lacking in detail. On the other hand, there is an abundant literature on the plant itself and on the dried spice.

All the preserved ginger entering world trade is prepared in Hong Kong, most of the raw ginger being imported from China with smaller quantities coming from Macao, Formosa and Japan. A large part of this ginger is preserved in brine and part of the fresh ginger imported is also salted. Small quantities of the salted ginger are exported to other countries but most of it is preserved with sugar in Hong Kong. The ginger is removed from the brine and washed and soaked in cold water for two days, several changes of water being made. It is then boiled for about 10 min., after which the ginger is removed and pricked with a fork.

The ginger is now boiled in a sugar and water syrup for 45 min., left to soak for two days and then re-boiled and packed in fresh syrup. Crystallised ginger is prepared by soaking and boiling for a third time to evaporate more water from the syrup. It is then removed from the syrup, dried, mixed with crystallising sugar and packed.

Ginger preserved in syrup is packed in 2 cwt. casks, 1 cwt. kegs and in small stoneware jars. Dry (crystallised) ginger is usually packed in cases (previously rendered air-tight by being lined with Chinese bamboo leaves) containing 48 heavily soldered tins, weighing 1 lb. each or 96 tins weighing ½ lb. each.

Preserved ginger has also been made in Jamaica and while precise details of the method used are not available it is believed that it was similar to that used in Hong Kong.

"Floors"—a new journal

A NEW journal—*Floors*—has started publication in association with the long established *Building Materials, Components and Equipment*, one of the Leonard Hill Technical Group. The first issue appears this month, May.

In recent years, there have been many new developments in both the construction and covering of industrial, domestic and other types of floor, and it has long been felt by architects and the building trade generally that there should be a publication devoted to giving details of these developments.

It is with this object that *Floors* has been published. Incorporating the Enquiry Card system that has been a feature of *Building Materials*, it will include articles on the various new methods of construction, new protective and decorative treatments, and reviews of new floor finishes as they are introduced. There will also be general articles dealing with the requirements of floors which have to serve a specific purpose in various kinds of industrial and commercial buildings, and a section devoted to the latest developments in other parts of the world.

A specimen copy is available by writing to The Publisher, *Floors*, 9, Eden Street, London, N.W.1.

Good egg

BRITONS are said to be growing hungrier for eggs. The old adage that "the egg is full of meat" was borne out scientifically a few years ago by Dr. Cruickshank. First-class protein, phosphorus and calcium for bone and tissue-building, assimilable iron, and the whole alphabet of vitamins: the list is formidable, though the housewife only notes the unimportant lack of xanthophyll pigment in the yolk when green plants or maize are lacking in the hen's diet.

At no time since the hen was domesticated from a wild fowl has she enjoyed such favour.

> Like royalty she goes her way,
> Laying foundations every day,
> Though not for public buildings, yet
> For custard, cake and omelette.

The literature of poultry-breeders telling of the care lavished on hens to encourage egg production provides a contrast to times when eggs were unappreciated despite the old adage quoted above. Coriolanus talks of "some trick not worth an egg," while Leontes cynically suggests an imposition with his: "Will you take eggs for money?" Today, instead of the disdain associated with the "egg-trot" or jog-trot of a housewife riding to market with her baskets of eggs, we are more inclined to Carnegie's maxim: "Put all your eggs in one basket and then watch that basket!"

Egg history has some fascinating asides before and after the Briton abroad became especially noted for his partiality for eggs and bacon or ham and eggs, which became "amenoicks" in one Balkan country. A trace of iodine in the egg was outdone in one instance when Budapest scientists caused the goose that laid golden eggs to be outbid by the hen that laid iodine eggs by using iodised feedingstuffs to increase the iodine content of the ultimate product.

With memories of the scarcity of eggs in recent years, it seems incredible that once they were freely used for inedible purposes. In the sixteen-hundreds eggs were commonly used for making mortar. Lime, "allum," glue, strong wort and 400 eggs went into the repair of Louth church steeple; while Joseph Moxon, F.R.S., had a recipe which made Mrs. Beeton sound small fry. "Half a pound of old Cheshire cheese, milk and the whites of eggs, Unslackt lime, all beaten in a mortar and stirred with a trowel" was his "doctrine for Handy-workers" or builders. Hundreds of eggs for mortar may sound a steep story, yet is fact in this steeple tale!

MODERN MALT PRODUCTS

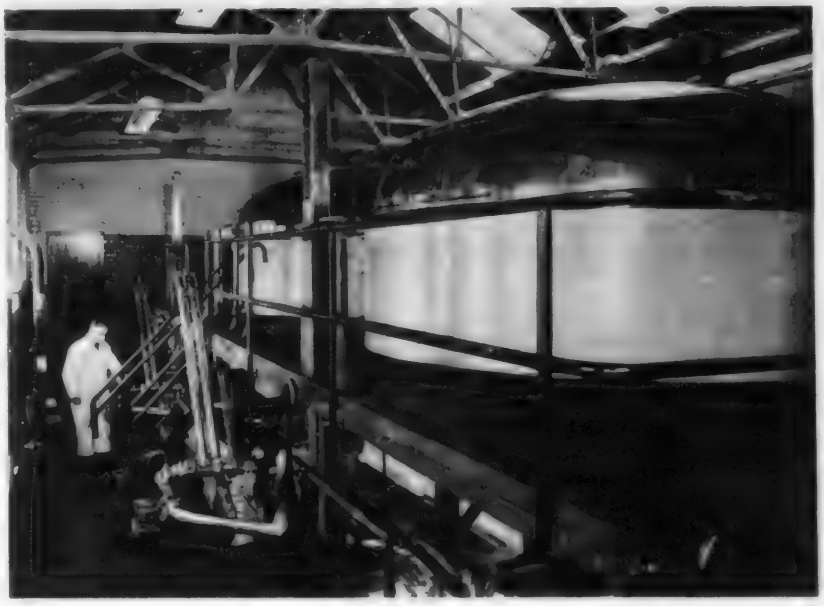
Edward Fison Limited bring a keynote of simplicity to their new factory at Stowmarket. Experience gained over more than a century results in greater productivity and higher product quality.

GONE are the days when malt uses were confined to brewing, vinegar manufacture, and the flavouring of cod liver oil. The biochemical properties of malt have opened up new fields over the past two decades. Breakfast foods, bread, and beverages; baby foods and biscuits; cattle foods, cakes, and confectionery; the alphabetical list is impressive all the way down to yeast culture media.

Edward Fison Limited entered the field at the turn of the century as a sideline to their malting business at Ipswich. Expansion brough the need of larger premises and a site outside Stowmarket was chosen, where the finest malting barleys are close at hand. The miller, the brewer, the sugar manufacturer, and the milk industry would be familiar with processes in the new factory. The history of the firm's expansion is one of adoption of the principles employed in these industries, their application and modification.

Malt can be made from any cereal, but barley and wheat predominate. A seed of corn is almost wholly composed of food reserves for the embryo plant. By allowing controlled germination the embryo secretes enzymes that change the food reserves into digestible matter. Starch is modified to soluble form; protein is broken down to smaller molecular size; by careful drying the life process is stopped when the extractable matter is maximal, and the enzymes are still at their most potent. For some purposes small quantities of malt are cooked, or even roasted, to accentuate flavour.

Such raw material offers considerable scope in its application to the food industries. Flavour, colour, nutrition, diastatic power, proteolytic power, dextrin to maltose ratio, all have been specified as controlled requirements. In the past decade, quality standards have risen by 15%. The scientific control of purchase and process has made completely new malt products possible.



Malt extract—the first stage of extraction.

Laboratory control

To cope with the scientific advance, both in customers' fields and their own, Edward Fison have placed their laboratories at the hub of their new factory. Three separate laboratories are concerned respectively with quality forecast and quality control and research. Quality forecast produces an accurate target for each production department, including yield performance as well as analytical specification. Quality control, though self-explanatory, gives invaluable help in spotting reasons for any targets not reached. This allows of the principle of "management by exception."

The research laboratory has its work programmed on a three-monthly basis or more. It is mainly concerned with applied research. Since April 1954 examples of its work are:

For the nutritional field (particularly yeast nutrition) a product guaranteed to have 95% of its total nitrogen in permanently soluble form.

For certain protein breakdown applications a new malt product four times stronger than previously.

In the amylase field an improved performance for *alpha*-amylase.

Malt flour and milling

"Make it simple—disregard beautification" was the insistent slogan while Stowmarket was being equipped. Careful grouping of machinery and attention to product and material flow paid a high productivity dividend in the milling department. However, machinery grouping was not allowed to interfere with accessibility for

General view of Fison's new Stowmarket factory.

maintenance or cleanliness and good housekeeping. Mills with specially fluted break rolls are needed to cope with the low moisture and ease-of-shatter of malt. Short length mills are used to avoid excessive capital outlay for a fluctuating market. By-products can be processed into low grade extracts for cattle feed. The mill staff also produce the crushed malt for the malt extract department.

Malt extract

The extraction procedure is similar to the first process of brewing followed by evaporation similar to that in the sugar industry. Crushed malt is delivered directly to the mash tuns by elevators. The mash tuns are worked on an overlapping batch process to provide a continuous flow of dilute liquor to the evaporators. Water used for extraction is exactly controlled in temperature to provide for two stages of extraction. The first low temperature stage extracts the enzymes which are thermolabile. For the second stage the mash is re-formed to be converted by residual enzyme at its optimum temperature. Water quantity is automatically controlled to give maximum extract.

Concentration of extracts takes place separately and also in two stages. The first concentration brings each extract up to 60% solids. The second stage finishes the syrups at 80% solids. Because of the thermolabile properties of the enzyme extract 29-in. vacua are required. Low temperature final concentration, associated with high viscosity of product, brings evaporator design problems in heat transfer. The finished extract is filtered, analysed, blended, and stored in 10-ton bulk storage vessels. Quality control maintains the bulks at standard analysis.

Simplicity, accessibility and cleanliness have again brought their reward. Doubling the batch size at Stowmarket was probably the simplest simplification. Automatic handling of mash tun residues, correct positioning of valves and controls, and mechanical aids have taken nearly all the drudgery out of the work. In this way more plant is controlled by each operative and productivity per man-shift has risen 25%.

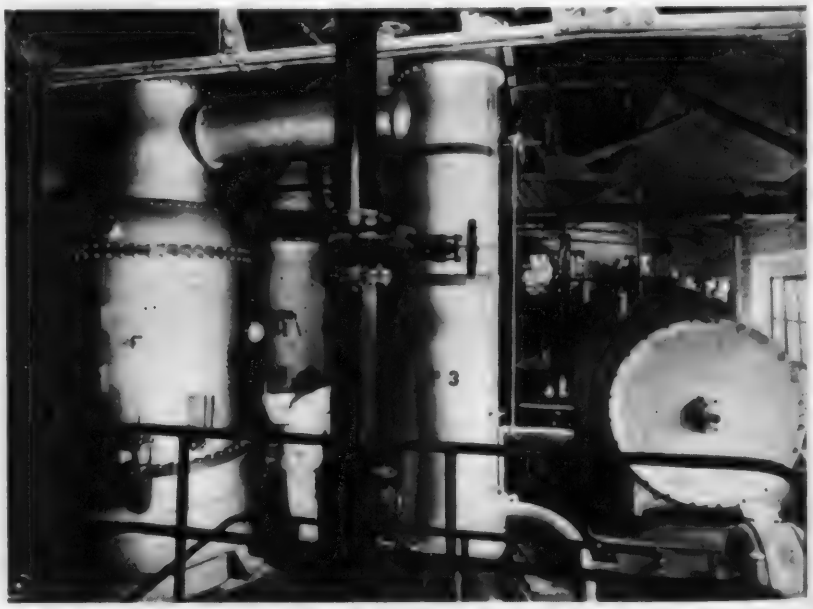
Dried malt extract

Only two firms have solved the problems of how to spray dry this intensely hygroscopic product. Spray drying is preferred because the output per hr. per £1 of capital outlay is much greater. The spray dried product has higher solubility and is less subject to specks resulting from overheating. Despite the high temperature in the spray chamber, high enzyme figures can be produced because of the short contact time.

Semi-concentrated extract is pumped on to a high-revving inverted saucer; droplets are flung off and fall through a current of hot air, reaching dryness near the bottom of the chamber.

The most recent advance in this department has been the in-

(*Turn to page* 184)



Final stage evaporation of malt extract. Note the bulk storage vessel on the right for loading road tankers.

Progress in Food Science

D.S.I.R. Reports on:

★ ***Blast frozen beef***
★ ***Tetrazolium test for fish freshness***
★ ***Fluidised and electronic smoke curing***
★ ***Fruit and potato storage trials***
★ ***Blackening of potatoes***
★ ***Predicting ripeness in bananas***
★ ***Destruction of grain pests***
★ ***Drying and storage of grain***

DETAILS of the first financial year of the D.S.I.R.'s five year plan, which was completed during 1955, are contained in the Department's report.* The Advisory Council states that the provision of resources has proceeded smoothly and the research programme is steadily rising. This is shown by the estimates for the year 1955-56 in which net expenditure is expected to be about £6·5 million compared to £6·25 million in 1954-55.

FOOD INVESTIGATION ORGANISATION

Frozen beef

Collaboration with the C.S.I.R.O. in Australia in the study of fresh, chilled and frozen beef continues, including the experiments on blast freezing described in last year's report (see FOOD MANUFACTURE, May, 1955, p. 198). It is now possible to freeze beef in an air blast tunnel operating at −35°C. with speeds up to 1,000 ft./min. or more. This saves time and labour as the sides of beef can be frozen within 24 hr. compared with the normal method of chilling for 1 to 3 days and then freezing for 3 to 4 days, while the faster rate of freezing is generally insufficient to cause "thaw" *rigor*. The overall loss of weight during air blast freezing was found to be less than that for normal methods.

However, blast freezing gives meat of poorer eating quality. Eating quality also seems adversely affected by treatment of the live animal in such a way as to give rise to less acid beef after slaughter. This is unfortunate because such beef drips less after freezing and thawing than normal beef. However, it may be possible to diminish drip without affecting the acidity of the beef by injecting magnesium sulphate in sufficient quantities to relax the animal before slaughter. Injections with phosphate or pyrophosphate have also been suggested.

Fresh meat

Plans have been drawn up for an experimental unit to be attached to a new centralised abattoir in preparation for more research, on the carcase scale, of meat in this country. Studies on the chemical changes occurring in dead flesh, which affect its bacteria-resisting capacity, suggest that other factors besides the proportion of connective tissue and of fat may affect the eating quality of meat. Investigations on the oxidation-reduction of flesh after death and the effect of bacterial growth are being made. From the point of view of bacterial spoilage this factor is as important as the acidity of meat.

Fish freezing and quality

Close liaison has been brought about between the fish division and the two statutory bodies, the White Fish Authority and the Herring Industry Board. In conjunction with these bodies the experiments on freezing fish at sea are being continued. The specially designed diesel-electric trawler, *Sir William Hardy*, mentioned in last year's report, was launched during the year and formally taken over by the Department and the trawler *Northern Wave* has commenced operations at sea.

Recognising the need for a convenient and reliable method for assessing the quality of fish and for a quick and simple test for ordinary market use, the fish division have developed papers impregnated with a suitable colourless tetrazolium salt which is turned red by the action of certain bacterial enzymes, the speed and depth of the colour production being directly related to the total activity of a bacterial population. The papers are laid on the wet surface of the fish and the depth of colour developed after various times read against colour standards. The correlation between quality and colour production was found to be reasonably good. The method, which promises to afford a speedy market test of fish quality, has been protected by a British patent application.

The surface browning of fish has been found to be caused by traces of copper in the curing salt. Salt manufacturers have been advised that copper should not be present in amounts greater than 2 to 4 p.p.m. (See FOOD MANUFACTURE, May, 1955, p. 198).

Smoke curing

Special attention has been given to research on smoke curing. A new smoke producer on the "fluidiser" principle is being developed and is the subject of two British patent applications. Sawdust is maintained in a state of violent agitation in a vertical tube by a blast of hot air. As the

* Department of Scientific and Industrial Research, report for 1954-55. Pp. 321. H.M.S.O. 7s. 6d. net.

chemical composition of the smoke given off depends on the temperature of the air and the amount of smoke on the weight of sawdust being treated, the type and amount of smoke passing into the chamber are controllable. A recording optical-density smokemeter has also been successfully evolved (see FOOD MANUFACTURE, March, 1956, p. 112).

Work has also been done on the electrostatic smoking of fish which can take place in existing kilns without any elaborate structural alterations. The process reduces visible effluent thus decreasing atmospheric pollution.

Fish by-products

A pilot plant capable of continuously handling 2 cwt. of raw material has been built for Torry Research Station to help research, in co-operation with the Association of Fish Meal Manufacturers, on processing white fish meal.

Remaining problems in herring oil and meal manufacture include the cheap but efficient destruction of offensive odours and the preservation of buffer stocks of raw materials. Research is proceeding on these items.

Fruit storage

Storage trials with apples and pears have shown that pears, which are usually stored at 34°F. in this country could be kept for longer periods at 30-31°F., without suffering low temperature injury, though this depends upon the uniformity with which temperature can be maintained. The best temperature for storing Cox's Orange Pippin apples is still considered to be 37-40°F.

Restricting the ventilation in a store to allow the accumulation of 5-10% carbon dioxide retards colour change, and storage in 5% carbon dioxide and 5% oxygen has again been found to delay ripening and to delay the incidence of lenticel rotting. Small scale tests have shown that equally good results can be obtained by storing the apples in low (3%) concentrations of oxygen in the absence of carbon dioxide.

Potato storage

An equation has been derived relating the temperature of an unventilated potato stack to its dimension and to the temperature of the outside air. The temperatures calculated from this equation have been found to differ by less than 1°F. from those observed in experimental stacks ranging from 9·5 to 96 tons. It is also possible to calculate from the equation the maximum height to which it is safe to store potatoes in any given condition.

Investigations have shown the rate of water loss from potatoes which have not sprouted to be independent of the rate of air movement when it exceeds a low value, and in sprouted potatoes to be directly correlated with the weight of sprouts. The effect of restricting ventilation on the sprouting of potatoes has been further studied and it has been found that to suppress sprout growth by gas storage it would be necessary to restrict ventilation so that some of the volatile products accumulate, removing continuously the carbon dioxide which would otherwise accumulate.

Investigations by the general biochemistry and biophysics division have shown that stored potatoes may be discoloured through rotting by various fungi. Several of the polyphenol constituents of the potato which are now being characterised and identified act as partial inhibitors to the fungi. It would obviously be desirable to select potatoes of higher inhibitor content by breeding. The blackening of sound potatoes when they are cooked is probably caused by similar substances (see FOOD MANUFACTURE, December, 1955, p. 499). Polyphenols have been paid comparatively little attention and therefore studies are being made on their biochemical function in plants.

Cold stores

Observations have been made on the construction and operation of cold stores for fruit and vegetables. Heat leakage was found to be due partly to uncertainty about the insulating value of construction materials and insufficient allowance for solar radiation. Refrigerating units in commercial fruit stores were examined and in one case it was found that incorrect arrangement of dunnage seriously affected the air distribution while in another case power consumption was reduced by 25% by modifying the supply of cooling air to the condenser.

Biochemical and biophysical research

The applications of ion-exchange resins, the cultivation of algae for food, wastage in canned hams, and wastage during the distribution of eggs were some of the problems handled by the general biochemistry and biophysics division, which aims broadly at explaining the fundamental basis of the handling of animal and vegetable foodstuffs with particular attention to new developments. For example, work by the division on the phospholipids of egg yolk has shown that they can be divided into two main fractions; the major lecithin fraction, which is comparatively stable, and a smaller phosphatidylethanolamine fraction which is as unsaturated as cod liver oil and rapidly oxidises in air. Attention must evidently be concentrated on the latter fraction.

Using the new tests which distinguish streptococci of the pig from those of human origin, surveys are being made in ham factories to find out how these bacteria pass from the gut of the pig into the finished ham.

Several investigations aim to improve the storage of fruits and vegetables including the studies on potato breeding described above. Possible methods for predicting ripeness in bananas are being studied and work has begun on the carotenoids of fruit and vegetables and the natural enzyme systems associated with them. These pigments affect the colour and flavour particularly when fruits and vegetables are dried. The "browning reaction" in dried carrot and cabbage has been shown to be between sugars and nitrogen compounds (the "Mail-

lard" reaction). The first intermediate has been isolated and is believed to be glucosylamine. More chemical work is needed before there is hope of interfering effectively with the reactions.

PEST INFESTATION LABORATORY

With the cessation of bulk purchase of foodstuffs by the Government and a return to private trading, the function of the Pest Infestation Laboratory is changing: commodities are handled in smaller quantities with shorter storage periods, and under these circumstances the dangers of cross-infestation from one consignment to another and from infected premises may well increase. In the laboratory experiments are being set up for the study of the dispersal of pests in grain and of the development of "mixed" infestations. Observations on grain removed from hermetic storage and kept in bags without drying have indicated that most of the micro-organisms normally associated with grain are destroyed by air-tight storage and this is being investigated in more detail. Work on the uptake and retention of fumigants by foodstuffs is being continued with special attention to ethylene dibromide which may prove useful for inclusion in a mixed fumigant for bulk grain.

RESEARCH ASSOCIATIONS

The year's work at the **British Baking Industries Research Association** (see FOOD MANUFACTURE, December, 1955, p. 491 for full report) covered fuel economy including investigations on the use of steam in glazing bread and the best methods of injecting wet and dry steam, a study of dough mixing by labelling ingredients with radioactive isotopes, fundamental work on the natural oils in flour and bread, the control of mould growth and the use of soya flour in flour confectionery, biscuit and wafer production and hygiene, which included the examination of Savoy bags of different materials for ease of sterilising. In this connection certain nylon fabrics appeared satisfactory.

B.F.M.I.R.A.—investigating the pasteurisation of pickled onions.

The **Research Association of British Flour-Millers** in collaboration with the National Institute of Agricultural Botany has continued investigating wheat varieties of improved milling and baking quality. Investigations have been made on the drying and storage of grain, the baking quality of flour, biochemistry of wheat, flour improvers and on oats and oat products.

Research work on a wide range of foods has been carried out by the **British Food Manufacturing Industries Research Association** which reports a satisfactory year which included the holding of a successful "Open Day" (see FOOD MANUFACTURE, August, 1955, p. 320). Examples of researches completed or in progress during the year include a report on the jellying behaviour of agar and work on the manufacture of fruit curds, studies of the melting and crystallising behaviour of cocoa butter and possible alternative fats, the keeping qualities of boilings and toffees, investigations on the flavour and colour of jams in relation to fruit varieties, collaborative work with the National Institute for Research in Dairying on the measurement of the plastic behaviour of margarine and cooking fats, a report on the prevention of shrinkage and separation in fish pastes and the design of a laboratory steriliser for the investigation of pasteurisation processes for pickled onions.

Many varieties of fruit and vegetables were tested during the year by the **Fruit and Vegetable Canning and Quick Freezing Association** for their suitability for canning and quick freezing. Studies have been made on the exchange of calcium between peas and water under various conditions of concentration and temperature, the corrosion of cans by Victoria plums and the calculation of process values for cans processed in static retorts.

One aspect of the **Printing, Packaging and Allied Trades Research Association's** work last year was the development of an apparatus used for studying the properties of cushioning materials. Experiments have also been made on the "shelf life" of packages made from different barrier materials, and the prevention of mould attack on packages.

Trace Elements in Food—1. LEAD

By R. D. A. Polhill, B.Sc., A.R.I.C.

(*Department of the Government Chemist*)

Lead, fluorine, copper and selenium are trace elements in which the Government Chemist's Department has recently been actively interested. This article is the first of a series by members of the staff of the Department on the detection of these trace elements in foodstuffs. Shorter analytical procedures have made it possible to determine the lead content of foods in a few hours.

MOST natural foods contain very little lead,[1] but contamination may occur, during processing and storage, from contact with such materials as solder or lead piping. Moreover the dust in cities may contain a considerable amount of lead from old paint or other sources.

In order to keep the lead content of foods to as low a level as is practically possible, the Foods Standards Committee of the Ministry of Food[2] has recommended limits for the lead content of certain foods and classes of food. For example, 1 part per million in wine, beer and cider; 0·2 p.p.m. in soft drinks ready to drink and 5 p.p.m. in canned fish and canned meat. A general limit is also recommended of 2 p.p.m. for other foods.

Analytical procedures for the determination of lead in food have been gradually shortened. New techniques have made it possible to reduce the time of determination to a few hours and the final estimation of as little as a few micrograms of lead allows a considerable reduction in the amount of sample taken.

Early work by Francis, Harvey and Buchan at the Government Laboratory provided a general method for biological material. This involved several steps including preliminary wet combustion of the sample, sulphide precipitation, electrolytic deposition of lead as peroxide, sulphate separation, and final colorimetric estimation as sulphide. Later Monier-Williams described a general method for foods which included the dithizone separation introduced by Allport and Skrimshire, the sulphate separation from bismuth where necessary, and a final colorimetric estimation as sulphide. For materials with a very high phosphate content a special procedure was described by Roche-Lynch. Clifford and Wichman, Biefield and Patrick, and others investigated the conditions under which lead may be quantitatively extracted as dithizonate with organic solvents.

Many methods have since been described for the determination of traces of lead, and a brief outline of the steps involved is given below.

Most methods involve final estimation of lead in, or by extraction from, alkaline solution by a colorimetric process. It is necessary, therefore, to treat the sample so as to obtain a more or less colourless solution in alkali containing the lead. With most foods complete destruction of organic matter is necessary, followed by separation from phosphates, etc. Exceptions are white sugar, fresh fruit, etc. for which dithizone extraction is satisfactory after mild acid treatment.

Destruction of organic matter

(*a*) Dry ashing in silica dishes at a temperature not exceeding 500°C. is often used. This is satisfactory for samples yielding a bulky ash which minimises absorption of lead by the material of the dish. Calcium or aluminium nitrate solutions are often used as "ash aids" and these also serve to increase the bulk of the ash. (Old silica dishes have a greater tendency to absorb lead than new unetched dishes.) Treatment of the ash with hot diluted hydrochloric acid gives a solution suitable for the next stage in the analysis. Any insoluble matter is filtered off. Elvidge and Garratt[3] have described the use of a calorimetric bomb for dry ashing samples for lead determination.

(*b*) Wet combustion with nitric and sulphuric acids is also commonly used. After a preliminary heating with nitric and sulphuric acids rapid oxidation of organic matter is achieved by addition of small amounts of nitric acid as the mixture reaches the charring point. The residual sulphuric acid, after heating to fuming should be colourless when cold. Fatty foods, curry powder, etc., tend to give a persistent yellow colour. This may often be destroyed by further treatment with nitric acid. Perchloric acid and ammonium oxalate have also been recommended for this purpose. To avoid loss of nitric acid by volatilisation, during the oxidation, refluxing types of apparatus have been described.[4]

(*c*) Other methods of combustion, including the use of perchloric acid, hydrochloric acid and chlorates, etc., have been reviewed by Middleton and Stuckey,[5] who recommended the use of nitric acid with a relatively small proportion of sulphuric acid.

Separation of lead from interfering substances

(*a*) Sulphide separation. The method recommended by the Association of Agricultural Chemists[6] (of America), and also used in the Society of Public Analysts method for lead in Food Colouring Matter, is precipitation of lead as sulphide from acid solution (*ca. p*H 4) with addition in the case

of the A.O.A.C. method, of pure copper salt to increase the bulk of the precipitate. The precipitated sulphides are dissolved in dilute nitric acid and lead determined as dithizonate in the A.O.A.C. method.

(*b*) The above separation is followed, in the S.P.A. method, by precipitation of lead as sulphate from aqueous alcohol. The sulphides obtained above (*a*) are digested with nitric and sulphuric acids, and aqueous alcohol added to the residual sulphuric acid to give an acid:alcohol:water ratio of 1:5:10. The total volume is kept as small as possible owing to the slight solubility of lead sulphate in the mixture. After several hours the lead sulphate is removed by filtration, dissolved in hot ammonium acetate solution, and lead estimated colorimetrically as sulphide.

(*c*) *Carbamate method.* This forms part of many recent methods in particular the Society of Analytical Chemists general method[7] for lead in food, and is used by Hart[8] for lead in flour, and Lockwood[9] in a general method for lead in food. Metallic diethyl dithiocarbamates are extracted from acid or neutral solution with an organic solvent, usually chloroform or carbon tetrachloride.

Diethyldithiocarbamic acid is unstable in acid solution and a more efficient extraction is obtained if, when extracting from acid solution, the solvent-soluble diethylammonium salt is used rather than the water-soluble sodium salt. Citrates, etc., are included when extracting from neutral solution to avoid precipitation of phosphates. The solvent extract of carbamates is evaporated and the residue digested with sulphuric, perchloric or nitric acids. Separation is achieved from phosphates and iron, but other metals including bismuth accompany the lead. Disadvantages are the instability of the carbamic acid referred to above, and difficulty in completely decomposing the residue from the extract. Lockwood adds potassium sulphate to raise the temperature of the digestion mixture.

(*d*) Dithizone extraction with chloroform or carbon tetrachloride from ammoniacal solution in the presence of citrate and cyanide, as used by Monier-Williams, separates lead from most other metals, and also from phosphates. If more than traces of magnesium are present, the citrate is not effective in preventing precipitation of phosphates, and loss of lead may occur by absorption on the precipitate. Recent work, at the Government Laboratory, by Johnson and Polhill,[10] has shown that this difficulty may be overcome by the use of sodium hexametaphosphate. This considerably delays, or entirely prevents, precipitation of amounts of alkaline earth phosphates normally present in foods, and allows a quick quantitative separation of lead from all ions except bismuth and thallium. The presence of large amounts of iron may oxidise dithizone in alkaline cyanide solution but this may be prevented by addition of hydroxylamine. Dithizone is often used as a solution in the organic solvent used for extraction, and may also be added as an aqueous ammoniacal solution as in the S.A.C. method. The extract of metallic dithizonates may be evaporated and decomposed by wet combustion, or more conveniently the metals may be removed by shaking with dilute acid. If 1% nitric acid is used, bismuth is extracted with the lead. Bambach and Burkey[11] use a nitric acid solution buffered at *p*H 3·4 to extract lead, leaving bismuth in the solvent layer.

Final estimation of lead

(*a*) *Sulphide method.* This has been used after the sulphate separation and is suitable for amounts of lead from 10-150 micrograms. The lead solution is made alkaline with ammonia and a brown colloidal solution of lead sulphide is formed by the addition of a few drops of sodium sulphide solution. Citrate and cyanide are added if calcium, copper and iron have not been removed by a previous separation. Solutions of gum arabic, etc. are sometimes used to stabilise the lead colour. Colours may be matched against standards similarly prepared or by means of a comparator or nessleriser. The colour varies slightly according to the method of production.

(*b*) *Dithizone methods.* Lead reacts in alkaline solution with dithizone to give a dithizonate soluble in organic solvents to a red solution.

Dithizone itself is also extracted by the solvents commonly used—*i.e.*, chloroform, carbon tetrachloride, or toluene—to give a green solution. Dithizone is extracted in decreasing amounts as the *p*H of the aqueous layer is raised, until at *p*H 11 and over, any excess remains in the aqueous layer. Clifford and Wichmann and others found that complete extraction of lead dithizonate may be obtained between *p*H 9 and 11 in the presence of cyanide and citrate as usually used for buffering and complexing purposes. Snyder[12] has described conditions for extending this range to *p*H 11·5.

(i) *Mixed colour methods.* In these methods such as that described in the A.O.A.C., lead is extracted from ammoniacal solution, at *p*H 9-10, with dithizone in chloroform giving an extract which varies in colour from green through violet to red. The strength of the dithizone solution and the volume used must be varied according to the amount of lead to be estimated. The colours obtained are matched against standards similarly prepared, or the optical density measured using a green filter, or at a wavelength of 510 or 520 mμ, amounts of lead being obtained from a standard graph. A modification of this method is by measurement of the optical density of the mixed colours at 600 mμ as well as at 510 (or 520) mμ. The reading at 600 mμ gives a measure of the free dithizone present and a correction may then be applied to the 510 mμ reading to give the optical density due to lead dithizonate.

(ii) *Monocolour methods.* A solution of lead dithizone free from excess of dithizone may be obtained as in the S.A.C. method by

extracting as in (i) above at *p*H 9-10 adding dithizone until a slight excess is present (indicated by a purple colour). The excess of dithizone is then removed by shaking the extract with dilute potassium cyanide solution (dilute ammonia and dilute ammonia-cyanide solutions are also used for this purpose). The colour is then matched with standards or its optical density is measured as above. There is a danger of loss of lead in this process as the excess of dithizone in the second stage is small.

Snyder extracts from a more alkaline solution *p*H 11·5, excess of dithizone remaining in the aqueous layer, thus obtaining an extract free from uncombined dithizone in one operation.

Irving's reversion technique consists of measuring the optical density at 600 mμ of a mixed colour extract both before and after shaking it with dilute acid. The difference in reading is due to free dithizone liberated by the action of the acid on the lead dithizonate, and is proportional to the lead present.

(iii) *Extractive titration methods.* These have been described by Lockwood, and others. The procedure used is to extract the lead from ammoniacal solution as above with very dilute dithizone solution. This is added in successive small portions, each portion being rejected if it is red after shaking. At the endpoint a purple or violet colour is obtained, and the total of dithizone solution used is proportional to the lead present. The dithizone solution is standardised by extracting a known amount of lead under similar conditions.

Another titration method used for sugars consists of developing the lead dithizonate colour in chloroform with a sufficient excess of dithizone to give a purple or violet colour. A blank solution, after adding the same amount of dithizone, is titrated with standard lead solution to match the sample colour. The amount of lead added then equals the lead present in the sample.

All dithizone methods described above are free from interference from other ions except for the possible presence of bismuth and thallium (tin is usually oxidised during preliminary treatment of the sample and does not then interfere), and are suitable for determination of amounts of lead from 0-40 micrograms. Bismuth and thallium are not likely to occur in foods; bismuth if present gives an orange-coloured dithizonate with a maximum optical density at 490 mμ.

(*c*) A recent method by Merritt, Hershenson and Rogers uses the ultra-violet absorption of the chlorides of the metals in 6N. HCl to estimate lead in a mixture of lead, bismuth and thallium.

Polarographic methods have also been described for estimation of small amounts of lead, but most are not very accurate below 10 micrograms of lead. An exception is that by Ferret, Milner and Smales, using a square wave polarograph. After dry ashing they obtain accurate estimations of 1-2 micrograms of lead.

In all methods, blanks should be as small as possible, reagents being obtained lead-free, or purified by distillation, or by extraction of lead as appropriate. These processes are described in the methods referred to above. It has recently been shown that positive errors can arise from lead in the filling materials in the graduations of pipettes when they are dipped into reagents. Cleaning of all apparatus with hot diluted nitric acid helps to minimise such errors.

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Modern Malt Products

(*Continued from page 178*)

troduction of the polythene-lined fibre drum which has proved superior to the lever lid tin in most applications.

Steam supplies

The planning of the new factory was a golden opportunity to introduce up-to-date improvements in fuel economy. The new boiler house generates low pressure steam from mechanically fired Economics. Automatic controls and good instrumentation are much in evidence. Steam savings have been made throughout the plant. The overlapping batch timing has made the steam demand more even. Despite two increases in coal cost since moving to Stowmarket the fuel cost per ton of product has come down 15%. The most spectacular improvement was made in the department which washes and sterilises returned empty containers. Standardisation of container size and mechanisation of the job cut steam usage by 75%.

A new beginning

The layout of the plant, and the possibilities of site development, give this enterprise a new beginning. A young team of executives, led by M. H. Baker-Munton, 34-year-old managing director, are in a good position to exploit the next decade of scientific advance.

This is a firm in which the simplification of production and full mechanisation, combined with watchful cost accounting, has streamlined management and operational efficiency.

Olive Products in California

By W. V. Cruess, Ph.D.

(*Department of Food Technology, University of California*)

California produces about 99% of the world output of canned ripe olives. These products are not generally known in Britain, but the author believes that if properly introduced and advertised they should become popular here. Dr. Cruess, who brought the green olive process to California from Spain in 1924, describes in this article the production and processing of several Californian olive varieties and olive products and the canning of ripe olives.

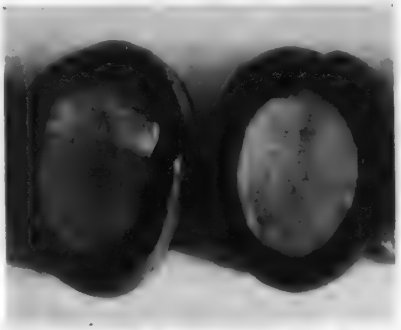
ACCORDING to Hartmann, olives are generally found only in two favourable climatic belts around the world, one of these being between 30° and 45° North latitude and the other between 30° and 45° South latitude. At higher latitudes low winter temperatures prevent successful culture of the olive, as the tree will not survive temperatures of 10°F. or lower. Olive trees will grow nearer the equator than 30° N. or S. latitude but are unfruitful, probably because winter temperatures are not low enough for proper flower formation.

Spain produces about 34% of the world's olive crop, Italy about 30%, Greece about 12%, Portugal about 8%, Tunisia 6%, and Turkey 4%. France, Algeria and several other Mediterranean countries also produce olives. Some are produced in Australia and Mexico and considerable quantities are grown in Argentina and Chile.

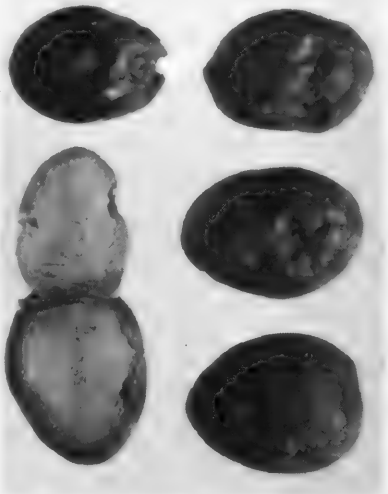
While California produces only about 0·5% of the world's total output of olives, it accounts for about 99% of the total U.S.A. crop and for a like percentage or more of the canned ripe olives of the world. Arizona in the U.S.A. has a small acreage of olives.

Olives are grown in Spain, Italy and other Mediterranean areas and in South America primarily for making oil; relatively few are used for pickling and practically none are canned. In California, on the other hand, they are grown chiefly for ripe pickling and canning. Only the culls and over-ripe olives are used for oil making in this State.

Since 1924, when the author brought the green olive process to California from Spain, the production of Spanish type green olives has become an important industry, that utilises chiefly the smaller sizes of the Sevillano and Manzanillo varieties. However, California produces, according to Hartmann, only about 12% of the olives of this type consumed in the U.S.A., the remaining 88% coming from Seville, Spain.



Olives with phenolphthalein indicator applied to cut surface to show depth of lye penetration in Spanish green process.



Effect of bacterial spoilage of olives during pickling.

The olive groves of the world cover about 12 million acres, whereas California has only about 30,000 acres. Yet, as previously mentioned, she produces nearly 100% of the canned ripe olives of the world and an important proportion of the Spanish type green olives.

Olives 3000 B.C.

Writers of ancient times mention the olive and olive oil. More or less mummified olives have been found in ancient Egyptian tombs. Evidently olives were used for oil and probably in the forms of salted or dried olives as early as 3000 B.C. Seeds of the olive were first brought to California from Mexico in 1769 by the Franciscan expedition led by Father Junipero Serra at which time the first Catholic Mission was built; in this case near San Diego, California. Several of these trees are still living near the Mission. The variety is known as the Mission and comprises about half the olive acreage in California. Numerous varieties were introduced from the Mediterranean countries between 1850 and 1900 but of these only four have attained commercial importance. Additional recently imported varieties are under observation at the University of California by Hartmann. One or more of these may prove worthy of commercial trial.

Previous to about 1900, olives were grown chiefly for oil making in California, although some were used for pickling by the ripe process for sale in bulk form. About 1900-05 preservation of the

Ripe olives being aerated in water during pickling.

pickled ripe olives in dilute brine in glass jars by heating the jars of olives in hot water was discovered by Professor Bioletti, of the University of California and Mrs. Freda Ehmann, a commercial producer. Later cans largely replaced glass containers for ripe olives. At first plain tin cans were used but as the bare metal caused bleaching of the black colour, enamel-lined cans have replaced the plain tin. They retain the colour almost perfectly. Enamel-lined cans for olives were introduced as a result of experiments conducted by the writer in the early 1920's.

Costly spoilage of canned ripe olives by a heat resistant spore bearing bacillus occurred in 1919-21 because the "sterilising" temperatures of 190-212°F. were inadequate to kill the spores. As a result of the research of Dr. K. F. Meyer of the University of California, Dr. J. R. Esty of the National Canners' Association, Drs. Dickson and Burke of Stanford University and Dr. J. C. Geiger of the U.S. Public Health Service, a safe sterilising procedure of 240°F. for 60 min. was established and is enforced by the Cannery Inspection Service of the State. Since adoption of this process no further spoilage has occurred.

As ripe olives have a rather high *p*H value, about *p*H 7·7-8·0, at time of canning, a rather severe retorting (sterilisation) is required.

Because of the favourable summer temperatures and low relative humidities the hot interior San Joaquin and Sacramento Valleys have become the preferred areas for commercial production of olives. They are grown under irrigation.

Varieties

As previously mentioned, the Mission is the most important variety grown in California. It is of "typical olive shape" with a distinct tip, of only medium size but of rich flavour, high oil content and good texture. It originated in Spain.

The Manzanillo variety is second in point of acreage. It hails from the Seville area of Spain, where it is used for Spanish style green olives, particularly those that are pitted and stuffed with pimiento. In California it is used for production of canned ripe olives and for green pickling. It is somewhat larger than the Mission and is nearly spherical in shape and with a smooth rather than pointed tip. It is of good quality for both ripe and green pickling, but is of lower oil content than the Mission and less rich in flavour. It is gradually replacing the Mission because of its larger average size, greater production per acre and greater ease of pickling.

The Sevillano variety, also known in the trade as the Queen, and in Seville as the Gordale, is third in acreage. It is of very large size, low oil content, of firm to slightly fibrous texture and suitable for both green and ripe processing. Usually it commands a higher price to the grower than do other varieties. It is a Spanish variety.

The Ascolano from Italy is fourth in importance. It is larger in size than the Mission and Manzanillo but smaller than the Sevillano. It is used for ripe processing and canning but not for green pickling. It is light in colour, tender in texture and of fair canning quality.

The Barouni is grown on a relatively small acreage for both ripe and green pickling. It comes from Tunisia where it is an important variety. It is of about the size of the Ascolano but of much deeper colour and of fibrous texture if allowed to fully ripen. It is of good flavour and rather high oil content.

Canned ripe olives

The pack of canned ripe olives in California in a normal year is about 2 million cases, a case being equivalent to 24 cans of number $2\frac{1}{2}$ size. As a result of an extensive advertising campaign, the consumption of ripe olives has increased more than 50% during the past four years. Until recently about half of the entire pack was sold in the three or four Western States of the U.S.A.

On a visit to Britain and the Continent several years ago the writer was unable to find California canned ripe olives in the shops; with one exception, that of Selfridges in London, who carried them for American visitors and for the few Londoners who had learned to like canned olives. To Europeans olives usually mean the green Queen and Manzanillos from Spain. The California ripe olive is, nevertheless, of very pleasing flavour and texture. It is of neutral *p*H, about *p*H 7, that is neither acid nor alkaline, whereas the Spanish green olive is sour in taste and of low *p*H value, usually below *p*H 3·8. Because of its non-acid taste, tender texture and mild flavour, one may eat with comfort several times as many of the canned ripe as of the Spanish

green olives. If properly introduced and advertised they should find favour in Great Britain.

The olives are picked for ripe processing when they have become straw yellow to a light pink in colour but long before they become black in colour, as at that stage they are apt to become too soft when processed. Each olive is picked individually by hand, a very costly operation. They must be handled carefully to avoid bruising. For the same reason shallow lug boxes are used for transportation of the fruit from the grove to the plant.

The harvesting season usually begins in mid to late September and ends about November 1. A severe frost may so damage the fruit that it becomes unsuitable for processing. Over-ripe and frosted olives are used for production of oil and may be picked as late as February 1.

The freshly picked olives are first graded for size by means of diverging cable type graders, usually into five or more sizes. They are then placed in large tanks and covered with brine of medium salt content, 20-25 salometer for Mission, Manzanillo and Barouni varieties, and one of lower salt content, usually 15-20 salometer for Sevillano and Ascolano varieties. From time to time saturated brine or dry salt is added to the brine until it reaches 30-35 salometer for Mission, Manzanillo and Barouni, and about 25 salometer for the Sevillano and Ascolano varieties. Usually the storage tanks are in the open in order that the sun's rays will prevent growth of mould.

Storage is for 1½ to 10 months. It is customary to store only the Mission and Manzanillo olives into the summer months, and these only in a very few plants. Most canneries close their processing operations by June 1. If the olives are to be held during the hot summer months, the brine should be built up by addition of salt to about 40° salometer (10% salt or 10° Baumé).

Some olives, especially those of the Ascolano variety, are pickled fresh directly after picking.

Concrete pickling vats for ripe olives.

Whether pickled direct from the tree or from storage brine, the pickling or "processing" procedure is about the same.

They are placed in shallow concrete or wooden vats, usually holding about one ton of olives. They are then treated five to eight times with dilute lye (sodium hydroxide) solutions, the first one usually of 1 to 1·5% sodium hydroxide content, and the subsequent solutions of 1 to 0·5% hydroxide content. The hydroxide is delivered to the cannery as a 50% solution, which is stored in a large tank and diluted with cold water as needed in the plant. Between applications which usually last for 1½ to 3 hr., the olives are exposed to the air for 3 or 4 to 24 hr., or covered with water which is vigorously aerated by compressed air. In either case the object is to oxidise the tannins and bitter principle at slight alkalinity, thus causing the olives to turn black in colour. The other purpose of the lye treatment is to destroy by hydrolysis the bitter principle (oleuropein).

The olives are then covered with water which is changed several times a day until the olive flesh is practically free of lye, which is judged by *p*H of a sample of the juice or of the cut surface of the olive flesh, the desired *p*H range being about 7·3 to 7·8. Above *p*H 8 the olives may lose colour or become soapy in taste during sterilisation.

When free of lye they are stored for 1 to 2 days in dilute brine, usually of about 10° salometer.

Formerly spoilage by *Aerobacter* or other bacteria sometimes occurred during leaching of the olives with water. This is very seldom encountered now as research at the University of California demonstrated that pasteurisation at 175-180°F. during leaching very effectively prevents such spoilage.

The olives are then size graded a second time, sorted from slowly moving belts, in respect to colour and to remove culls.

They are canned usually by weight in enamel-lined cans, a hot brine of 10-12° salometer is added to fill, and the cans are sealed in a steam flow type double seamer. In this manner a good vacuum is attained after retorting and cooling and an exhaust box is unnecessary. Cans of tall pint, tall quart, number 1 tall and 8 oz. are the usual containers; but some olives are packed in number 10 and in buffet size cans. A few are packed in glass containers, probably less than 1% of the total pack.

The sealed cans are placed in retort baskets or retort cars and processed (retorted, sterilised) at 240°F. for 60 min. The cans or jars in each retort load must be coded with a lot number and dated. Retorting is done under the inspection of the State Board of Health. Also a recording thermometer must be used and the

charts properly numbered and dated for information of the State Board's inspectors. These regulations apply also to other non-acid canned foods such as non-acid vegetables and meat products.

The cans of olives are usually labelled and cased directly after retorting and cooling. The cases are stacked on pallets and the pallets transferred by lift truck to the warehouse.

Whenever possible the olives are moved by conveyor or by special pump and pipe line and hand operations are cut to the barest minimum. Sorting of the raw olives as received at the plant and of the pickled olives just before canning require the most labour. Conveyors carry the cans from the retorts to the automatic labellers and from the labellers to the automatic caser. Stacking or casing of unlabelled cans is very seldom done. Much of the pack is labelled with chain store or wholesale distributors' labels, although in most plants the cans carry the canner's label.

The dilute lye solutions used in pickling are used several times by collecting the used solutions in a sump and reinforcing it by addition of a 50% solution of hydroxide. Concentration is controlled by titration of a 10 c.c. sample with standard acid solution.

Green ripe olives

A product that is increasing in popularity is the so-called green-ripe canned olive. According to Webster, it is prepared as follows in one large cannery. Only fruit directly from the tree is used as brine stored olives do not give the desired "home cured" flavour and colour. Two lye solutions are used, the first for about 18 hr. and the second for about 24 hr. The olives are then leached with water changed three times a day for about three days. They are then covered with brine of 12° salometer for two days, the brine being changed three to four times in that period. They are then size graded and canned as previously outlined for canned ripe olives.

Retorting canned olives. In the foreground are the retort baskets containing the cans. Three large horizontal retorts are in the rear.

Pitted olives

Canned pitted olives have become popular. The olives are pitted after pickling and final grading. In one large plant, the Lindsay Ripe Olive Co., a machine designed by the company's engineering department is used; in other canneries the Ashlock pitter is used. Both machines by means of special attachments arrange the olive in a vertical position. A coring tube moves in from one side and makes a circular cut in the olive. A punch pin moves in from the other side to the pit; the coring tube withdraws and the punch pin punches the pit out of the fruit. The capacity of the Lindsay machine is about 800 olives per min.

The olives are canned and sterilised as described for unpitted ripe olives. The Lindsay Ripe Olive Co. was the first to can pitted olives.

Spanish green type olives

For the most part the smaller sizes of Sevillano and Manzanillo olives are used for green pickling, although some of the larger sized fruit is used. The process resembles that used in Spain.

The olives are picked after attaining of full size but before any pink or red colour develops in the skin. At the plant they are size graded and then treated in shallow tanks with dilute sodium hydroxide solution; usually of 1·5 to 2·00% NaOH content. Our experiments indicate that a solution of 1·50 to 1·65% is best for the Sevillano variety and that a somewhat stronger solution can be used with the Manzanillo. If too strong the lye may cause sloughing or loosening of the skin or internal "water pockets." The lye is allowed to penetrate from one-half to two-thirds to the pits. It is then removed and replaced with cold water, changed frequently over a period of 12-24 hr. to leach most of the NaOH from the olive flesh. The water changes are made without undue exposure to the air as oxidation results in darkening of the skin. The olives are then usually placed in 50-gal. oak barrels, which are then "headed up" and filled with a strong brine of 50 to 60 salometer for Manzanillo olives and usually 20-25 salometer for Sevillanos. The strong brine equalises with the olives to about 26-30° salometer. To the dilute brine in the Sevillano barrel half-ground rock salt is added several times during a two-week period to bring the final concentration to about 27-30° salometer.

At the Pacific Olive Co. of Visalia, California a large proportion of the pack is "cured" in wooden tanks about 14 ft. in diameter and 4 ft. deep. The fresh olives are placed directly in the tank, are lye treated, washed nearly free of lye in water and covered with strong brine. A slatted cover is put in place. When

the fermentation is well under way the tank is closed by flooding the slatted cover with melted paraffin or melted crystalline wax. This prevents growth of destructive film yeast and oxidation. If the tanks are indoors the room is maintained at 75-85°F. by a suitable heating system; if in the open the tank is elevated about 15-18 in. above the ground and the space thus formed is enclosed. Steam is bled into this space to maintain the tank at 75-85°F. At this temperature fermentation is very rapid and may be completed in as short a period as 60 days.

Barrelled olives also may be incubated in a warm room.

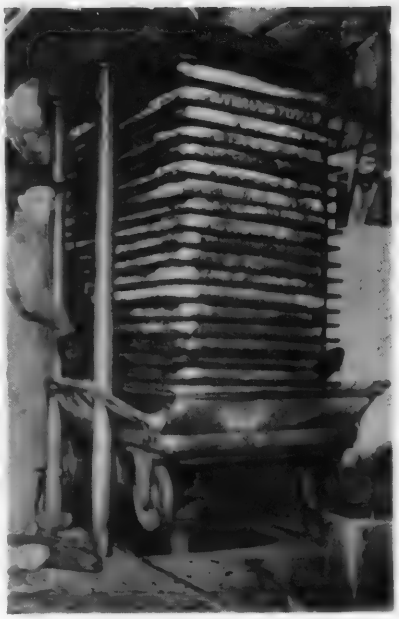
The bulk process using tanks holding up to 15,000 lb. of olives saves greatly on labour in all operations.

In both the bulk and the barrel processes addition of dextrose or other sugar is usually made after fermentation is well under way because lye treatment and subsequent leaching with water remove much of the naturally occurring fermentable sugar and mannite. After the olives have attained the desired acidity, colour and flavour, they are separated from the brine, size graded mechanically and carefully sorted on a slowly moving belt. They may then be packed in jars, rinsed in the jars with water by machine, the jars filled with plain brine of about 28° salometer, or if the olives are not sufficiently high in acid the brine is acidified with lactic acid or vinegar.

Fermentation of green olives is due chiefly to lactic acid bacteria, although in the early stages other organisms are also active. The final total acidity should reach 0·7 to 1·0% or higher expressed as lactic, and according to Vaughn, *et al.* a *p*H value of 3·8 to 4 or lower.

If the acidity is too low (the *p*H value above 4·3) "zapatera" spoilage may occur. It is characterised by a disagreeable and peculiar sage-like odour and flavour, although the olives remain firm. It occurs also in Spain.

Occasionally gas-forming bacteria (*Aerobacter*) cause gas



Processing crushed olives for oil.

pockets or blisters early in the fermentation. Inoculation of the brine in the barrels or tanks with a vigorous culture of a homofermentative (non-gas-forming) lactic culture or slight acidification of the initial brine are measures that tend to "head off" bacterial spoilage.

Chopped olives

A popular olive product is canned chopped olives. The pickled ripe olives are pitted by an Elliott pitter that tears the flesh from the pits. The shredded flesh is chopped coarsely by machine, and filled by machine into small cans. These are sealed in a steam flow double seamer and retorted at 240°F. The chopped olives are used as flavouring in stews, or with rice or in salads and as the base for a mixed spread or filling for sandwiches.

"Greek style" olives

These are made by storing "dead" ripe olives with about 1 lb. of half-ground rock salt for each 2 lb. of olives in shallow vats. The olives and salt are shovelled over once daily until osmotic action of the salt has dried the olives to about one-half their fresh weight and enzymes have destroyed most of the bitterness. They are then screened to remove the salt and boxed or barrelled with some salt after coating with olive oil.

Another procedure consists in storing them for several months in a strong brine. This more nearly approximates the European Greek process and gives a plumper final product, also greater yield.

Oil

The black ripe olives remaining on the trees in December to February and the culls from the sorting belts in the cannery are crushed, pressed in very strong camels' hair or fibre bags and the resulting mixture of oil and juice is centrifuged to recover the oil. The crude oil is filtered; aged in metal tanks for a month or longer and then packed for retail sale in cans or glass bottles. Unlike the usual procedure in Europe, California oil is not refined but is usually packed as the natural virgin oil. Therefore, it is richer in flavour and of deeper colour than the refined. It is used in this condition or is blended with the imported oil to improve the flavour and colour of the latter.

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The Kluyver Fermentation Test for Detecting Preservatives in Foods

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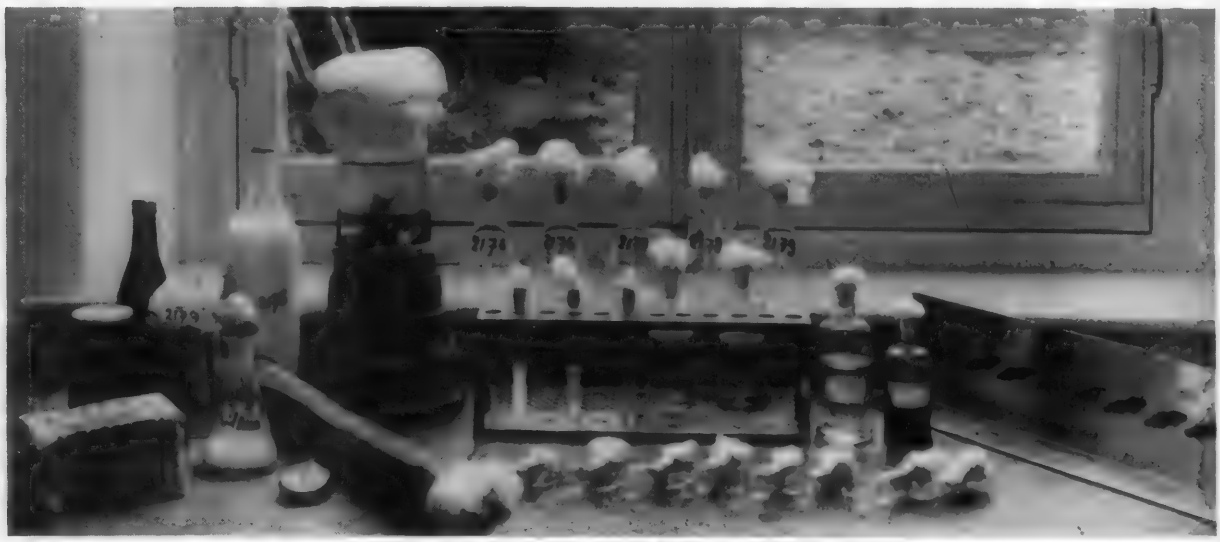
Chemical methods for detecting preservatives in foods are usually tedious and time-consuming. By comparison the Kluyver fermentation test is rapid and simple. Although non-specific, it is still a most useful test, applicable to many foods. Here the author describes how it can be used for jam, beer, lemonade, milk, ice cream, meat products and margarine.



Apparatus and reagents needed for the Kluyver test.

THE PRESERVATION of non-sterile foods by adding antimicrobial agents can only be permitted if two conditions are complied with: (i) preservation though necessary, is impossible or impracticable by physico-technical means, such as drying, refrigeration or sterilisation; (ii) the products for use as antimicrobial agents are innocuous and do not otherwise present public health problems[1].

Unfortunately some manufacturers occasionally use preservatives which do not comply with these requirements in so far as (i) other means of preservation are readily available and (ii) the agents used are more or less toxic. Among the preservatives used illegally are such powerful toxic compounds as the derivatives of bromoacetic acid[2,3], complex mercury compounds[4] and actidione[5].

In the battle against these illegal preservatives, food inspection laboratories may use various chemical and physico-chemical methods of analysis. However, the search for an unknown antimicrobial agent may at first be a complicated and time-consuming task, even with modern analytical methods such as partition chromatography[6,7,8] and infra-red spectrophotometry[9], because of the enormous variety of structures and compounds proposed or used as antimicrobial agents in foods (*cf.* Table 1). Sometimes there may even be no indication of the best line of chemical approach, *e.g.* where an antibiotic of unknown structure is used, which has been prepared by or on behalf of the food producer.

It is for these reasons that non-specific *microbiological* methods, revealing the presence of an antimicrobial agent, have been adopted for the detection of preservatives, and recently also for antibiotics. Such methods were proposed early in this century, independently by Blyth in England[10], by Lüehrig in Germany[11], by Kluyver, Delft, The Netherlands[12] and by the French worker Lignières[13].

As is shown by Table 2, various procedures have been adopted to study the activity or the development of the test microbes seeded in the food under investigation: Blyth used dye reduction as a criterion, Luehrig followed the activity of his inoculum by polarimetry, Kluyver used a gasometric technique, whereas Lignières based his conclusions on macroscopic changes. More recently acidimetric methods and modifications of Heatley's[14] hole diffusion principle have been applied also.

We have obtained most reliable results with the gasometric technique, introduced by Kluyver. This

Table 1—Antimicrobial Food Additives

1. Preservatives (*mineral or synthetic*)			2. Antibiotics (*of biological origin*)	
1·1 *Acids/salts*	1·2 *Esters*	1·3 *Various structures*	2·1 *Antibacterial factors*	2·2 *Antifungal factors*
HF	*p*. Hydroxybenzoic	Formalin	Penicillin	Actidion (cycloheximide)
H_2SO_3	Vanillinic	Urotropin (Hexamine)	Streptomycin	Mycosubtilin
H_3BO_3	Gallic (C_1–C_4)	Silver (*Katadyne*)	Chloramphenicol	Rimocidin
HNO_3	Monobromoacetic	Hydrogen peroxide	The tetracyclines	Fradicin
Benzoic acid		Chloramines	Viomycin	Nystatin
Salicylic acid		Chloropicrin	Erythromycin	Candicidin
p. Chlorobenzoic acid		Quaternary ammonium compounds	Subtilin	Iturin
Formic acid		Naphthoquinones	Polymyxin B	Filipin
Propionic acid		Derivatives of thiourea	Nisin	
Peracetic acid		Complex mercury salts	The antibiotics prepared by or on behalf of food manufacturers.	
Dehydroacetic acid		Epoxy compounds		
Sorbic acid		Organic tin compounds		
Unsaturated fatty acids, other				

paper reviews the application of this fermentation technique as a "universal" test for antimicrobial agents in all common foods.

Principles of Kluyver's test

Principle.—The microbiological method for the detection of antimicrobial activity suggested by Kluyver[12] is based on the principle that unpreserved sugar-containing substrates, after inoculation with bakers' yeast, are fermented on incubation, whereas fermentation is inhibited or retarded if a preservative is present. The simplest method based on this principle is to use the product under investigation as the medium, if need be after suitable enrichment with nutrients favouring the development of the micro-organism used. In more involved procedures the antimicrobial compound is extracted from the commodity under investigation, and the extract tested for inhibitory action.

Significance.—It should be borne in mind that the microbiological test gives only a general indication of the presence of active concentrations of preservatives; it is therefore a non-specific test. The structure of the compound or compounds actually present can only be discovered by extraction and identification.

However, this non-specific test is useful for many purposes. If milk, properly inoculated and incubated, is not fermented, this is sufficient evidence in many countries for its seizure, since the use of any preservative in milk is prohibited. The same situation prevails in most countries for canned foods, sausage, ice cream and beer.

Precautions.—When applying Kluyver's principle it is imperative to take all possible steps to avoid false positives, *i.e.* to make sure that absence of fermentation is always caused by the presence of an added antimicrobial agent and not by minor abnormalities in the commodity under investigation or in the inoculum.

First of all the activity of the test strain used should be checked regularly in suitable blank experiments. If this is not done and the inoculum happens to be impaired for some reason, false positives for preservatives are obtained, which may seriously harm the reputation of the technique.

In the second place it may happen that the product under investigation contains natural antimicrobial agents, *e.g.* lysozyme in raw egg products or essential oils in various plant foods[15]; or, in normal commercial practice, complying with existing food regulations, antimicrobial chemicals may be added, *e.g.* in meat products, where generally nitrates and sodium chloride are used as curing agents. If this is the case, the Kluyver test should be so modified as to indicate the presence of abnormal preservatives, without the naturally or normally present antimicrobial factors interfering with the results.

Finally, some foods may lack the nutrients necessary for growth and/or metabolism of the test strain. To prevent false positives for preservatives in this case, it is necessary to enrich the food itself—or the extract, if this has to be used—with the necessary growth factors.

Accuracy.—The volumes of gas formed in replicate determinations agree to roughly ±10%. Therefore, a reduction in gas formation of > 50% can be safely called significant inhibition of fermentation and relied on as indicating the presence of an effective level of an antimicrobial agent.

Advantages and limitations of the test

In the Kluyver test *Saccharomyces cerevisiæ* in the form of bakers' yeast is used as the test strain. This technique offers the following advantages for application in food inspection practice.

(i) Bakers' yeast is always available in commerce as a source of a *Saccharomyces* strain, constant in activity and resistance.

For the professional microbiologist this saves the trouble of manipulating with a pure culture, which—owing to repeated transfers—may degenerate, mutate or dissociate; for the chemist who is no expert microbiologist, the use of bakers' yeast is a means of carrying out the useful microbiological test without having to employ or even to consult a trained microbiologist.

(ii) *S. cerevisiæ* is not inhibited in its development by quite considerable decreases in *p*H[16].

Hence the presence and the subsequent de-

Table 2—Survey of Applications of Microbiological Technique for detecting Preservatives and Antibiotics in Foods

Technique	*Test strain*	*Food products*	*Authors*
Reductometric	*Str. lactis*	Milk	Blyth[10] Moldavan[66] Neal and Calbert [67]
Polarimetric	*S. cerevisiæ*	Saccharine products	Lüehrig and Sartori[11]
Gasometric	*S. cerevisiæ*	Saccharine products	Kluyver [13]
		Beer	Bleyer and Diemair[68] Mossel[43]
		Lemonade	Mossel and De Bruin[34] Van Heel[69]
		Marmalade	Mossel[42]
		Proteinaceous foods	Mossel[51]
		Milk and ice cream	Mossel, Mandersloot and Gentis[44]
	S. rouxii	Marmalades	Bernaerts[53]
	S. cerevisiæ	Margarine	Mossel[1]
Acidimetric	Various bacteria	Beer	Baetsle[70] Cornut[71] Baetsle, Mossel and Verheyden[23]
	Str. lactis	Milk	Kosikowsky *et al.*[72] Lemoigne *et al.*[73] Pien *et al.*[74] Dahlberg[75]
	S. cerevisiæ	Milk	Lagrange *et al.*[76]
	Str. lactis	Milk	Galesloot[77]
Bacterimetric	Various bacteria	Milk	Lignières[13]
	Serr. marcescens	Canned meat products	Drieux and Thiéry[78]
	Staph. aureus	Milk	Mattick[79]
Diffusometric	Various bacteria	Milk	Kosikowsky *et al.*[72] Jacquet and Steeg[80]
Turbidimetric	*S. cerevisiæ*	Beer	De Clerck, Aubert and Jerumanis[47]

velopment of a few acid-forming bacteria in the food under investigation, or even in the yeast cake itself, does not interfere with the test, *i.e.* does not cause false positives in unpreserved foods.

(iii) *S. cerevisiæ* is not inhibited by antibiotics such as penicillin, chloramphenicol and the tetracyclines[17, 18, 19] used in veterinary medicine; this is of great value when the technique is used for testing liquid milk for added preservatives.

Of course, this advantage turns into a disadvantage when it comes to detecting these specifically antibacterial antibiotics in foods where they have been incorporated deliberately[20, 21, 22, 23, 24, 25, 26, 27].

However, there is no need to apply the fermentation technique in those cases, since various excellent and simple tests have been developed for detecting them in connection with the analysis of drugs and of animal feeds enriched with antibiotics[28, 29, 30, 31, 32].

For this purpose we successfully applied an acidimetric technique, using two sensitive strains, *viz. A. aerogenes* and *Str. fæcalis*[33], in parallel tests.

Applications of the technique

In the author's Institute the Kluyver technique has so far been successfully applied to beverages, jams, beers, milk, ice cream, cured meat products and margarine.

General.—It goes without saying that it is essential to choose a good brand of bakers' yeast and to store it under suitable conditions.

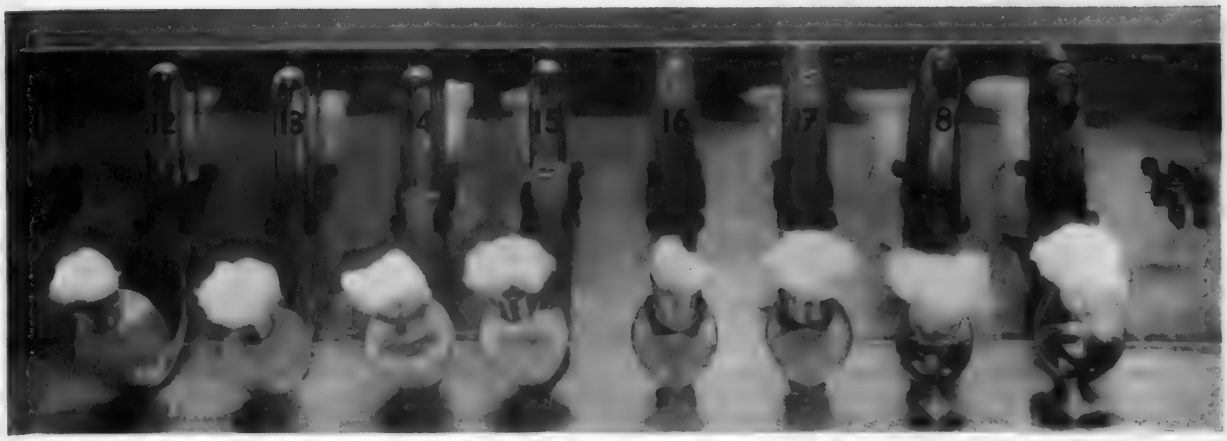
The activity of the yeast should be tested by diluting it to about 10^4 cells/ml. in sterile 10% glucose/0·25% yeast extract/water and incubating this inoculated solution in Einhorn (Smith) fermentation tubes for 30-36 hr. at 25°C. At the end of this test (i) the closed part of the tube should be entirely filled with gas; (ii) microscopic examination of the sediment present in the tubes should reveal the presence of almost exclusively yeast cells.

In order to maintain a satisfactory yeast preparation, it should be bought in closed packages only and be stored in the refrigerator at 2-5°C. for not more than 3 days. If no satisfactory brand of bakers' yeast is available, a pure culture of *Saccharomyces cerevisiæ* must be used instead.

Non-alcoholic beverages[34].—The beverage under investigation is first of all freed from carbon dioxide and, if necessary, sterilised by filtration. It is then inoculated with about 10^4 cells/ml. of *Saccharomyces cerevisiæ* which gives speedy results, *i.e.* after 36-48 hr. at 25°C.

In testing "imitation fruit drinks," *i.e.* beverages prepared from sugar, citric acid, dyes, flavour and only traces of—or even no—fruit juices, it is necessary to prevent false positives by enriching the product under investigation with 0·25% of dehydrated yeast extract as a source of nutrients. This is carried out by adding 2% by volume of a sterile 12·5% *Difco* dehydrated yeast extract solution.

If it is permissible to use benzoic acid or sulphur dioxide as a preservative, which is the case with most lemonades in The Netherlands, the beverage under investigation should first be adjusted to pH = 5·5 ± 0·1. Since these acidic preservatives are only active in the molecular state they are inactivated by the ionisation occurring at higher pH values[35, 36, 37, 38] and hence no longer interfere with the detection of other, *i.e.* illegal preservatives.



Results obtained by the Kluyver test. *Left to Right:* **Duplicate tubes of respectively the control (12/13), a definitely retarded test (14/15), fully inhibited fermentation (16/17), and a case where even growth of the inoculum was inhibited (18/19).**

In Table 3 the threshold levels of detection, *i.e.* the levels giving at least 50% reduction of gas formation, are given for a few of the preservatives which are occasionally used illegally in different countries.

Table 3—Threshold Levels of Detection of a Few Preservatives in Lemonades

Preservative	*Threshold level* %
Sodium fluoride	5×10^{-2}
Methyl *para*hydroxybenzoate	5×10^{-2}
Ethyl monobromoacetate	2×10^{-5}
Cetyltrimethyl ammonium bromide	1×10^{-2}
Sodium dehydroacetate	1×10^{-2}

The essential oils, tannins or other slightly antimicrobial compounds present in fruit juices, will not inhibit fermentation at the concentrations that occur in fruit drinks—with one exception: the citrus oils, present in some cloudy citrus drinks. Since the antimicrobial activity of these essential oils has been shown to be due to autoxidation products of limonene[39, 40] the inhibition of fermentation in unpreserved drinks of this type may be overcome by reducing the peroxides by adding a few pieces of boiled liver[41, 34].

Jams, jellies and syrups[42].—For the detection of preservatives in jams, jellies and syrups, one can use the same test as is applied to lemonades. However, in these cases, the commodities should first be diluted in order to reduce the osmotic pressure of the fermentation system to non-retarding values. For this purpose jams, jellies and syrups are aseptically diluted 1:5 with 0·3% sterile aqueous *Difco* yeast extract solution, which at the same time guarantees a sufficient supply of nutrients in the dilution obtained.

Most jams have to be free from any preservative. Hence in most cases the test can be applied to the diluted commodity without any further precaution. It then has the sensitivity given by Table 4.

If, however, as in certain cheaper products, sulphurous acid or benzoic acid or a combination of both is permitted, the test has to be modified as described in the section on lemonades. The sensitivity in that case is the same as reported in Table 4, with the obvious exception that those acidic preservatives can no longer be detected.

When the test is applied to marmalades, which may contain traces of citrus oils, the precaution of reducing the redox potential of the medium by the addition of liver particles may be necessary. In our experience, the better quality Dutch marmalades especially contain enough limonene peroxides to inhibit the fermentation of the 1:5-dilution, used in the test, when no liver is used.

Table 4—Threshold Levels of Detection of a few Preservatives in Jam at pH=3·0—4·0

Preservative	*Threshold leve* %
Sulphurous acid (calc. as SO_2)	8×10^{-2}
Benzoic acid	3×10^{-2}
Methyl *para*hydroxybenzoate	3×10^{-1}
Ethyl monobromoacetate	1×10^{-4}
Sodium dehydroacetate	5×10^{-2}

Beer[43, 33].—Beers generally contain insufficient sugars for active fermentation. Therefore, in order to prevent false positives, it is necessary to add some fermentable sugar, preferably glucose, to every beer under investigation. Some types of beers, moreover, are deficient in nitrogen compounds[44] and in B-vitamins[45]: this requires that some source of nutrients shall be added to the beers under investigation. We have found that the nutrient mixture, recommended by Wickerham (so-called "yeast nitrogen base"[46]) supplies all the growth factors required.

Yeast nitrogen base, moveover, has an important advantage over yeast extract for use with commodities like beers, which contain adequate amounts of micronutrients and only need supplementation with certain growth factors. Yeast extract contains thiol- and other peptidic compounds, which neutralise the action of several preservatives[34]. Yeast nitrogen base does not, hence it can be added to enrich a beer without prejudicing the sensitivity of the fermentation test.

Wickerham's yeast nitrogen base is commercially available as a dehydrated product and is therefore as easy to use as powdered yeast extract.

In bottled beers, especially when they are poor in non-alcoholic extractives, traces of antimicrobial factors which have not the slightest effect in other commodities suffice for stabilisation. In order to be able to detect these traces we had to apply a principle first suggested by De Clerck[47], *i.e.* exposing the test inoculum, prior to the fermentation test, to the action of the beer without weakening the latter's eventual antimicrobial properties by the addition of nutrients. During the preincubation, the number of viable cells in a normal beer may increase considerably, whereas it falls sometimes virtually to zero if preservative is present. The consequent large differences in the numbers of viable cells present when the beer is enriched are reflected in the rate of development of the fermentation.

For this purpose, the beer under investigation and a control are first of all inoculated with 10^2/ml. of *S. cerevisiæ* and incubated for 24 hr. at 25°C. Thereupon it is enriched with (i) 5% by volume of a sterile 50% glucose solution; (ii) 10% by volume of a filter-sterilised ten-fold strength solution of Wickerham's mixture of growth factors. The gas formation in this test is, as usual, read after an incubation period of 36-45 hr. at 25°C.

The threshold levels of detection for a few current antimicrobial factors in Dutch pilsen beer are given in Table 5. Neither hop constituents nor other compounds, legally used in beers, interfere with the test[43, 33].

Table 5—Threshold Levels of Detection of a few Preservatives and an Antibiotic in Beer

Antimicrobial factor	*Threshold level* %
Ethyl monobromoacetate	1×10^{-5}
Phenylmercury salts	$1–5 \times 10^{-5}$ (Hg)*
Cetyltrimethyl ammonium bromide	5×10^{-4}
Sorbic acid	2×10^{-3}
Actidione	3×10^{-6}

* The antimicrobial activity of phenylmercury salts and hence their level of detection depends, among other factors, on the character of the anion.

Beers containing over 5% alcohol are not readily fermented by bakers' yeast. Hence, such commodities must be diluted to an alcohol content of about 5% before being tested. The sensitivity of the tests is reduced correspondingly.

Milk[48].—Since *Saccharomyces cerevisiæ* does not ferment lactose, in the testing of milk for preservatives 2·5% of glucose is added in the same way as just described for beers.

Although bakers' yeast is not sensitive to reductions in *p*H, which may be caused by development of lactic acid bacteria normally present in milk (*vide supra*), it is nevertheless undesirable that the yeast should be overgrown by lactic acid bacteria, since in that case less reliable blank values (*i.e.* fermentation of unpreserved milk) may be recorded. Unfortunately milk cannot be heat-sterilised before subjecting it to the fermentation test, because that would inactivate by hydrolysis one of the important groups of preservatives illegally used in milk products, *i.e.* bromoacetic acid derivatives[49, 50]. The sterilisation of milk by filtration is impossible for obvious reasons. Attempts to sterilise acetic acid sera derived from milk by filtration have also resulted in considerable losses of preservatives.

In over 100 tests, we have been successful in getting round the necessity for sterilisation by using an inoculum of not less than 10^4 cells/ml. of *S. cerevisiæ*; in this procedure the results are read after 48 hr. at 25°C. The sensitivity of this test is shown by Table 6.

Table 6—Threshold Levels of Detection of a few Preservatives in Milk

Preservative	*Threshold leve* %
Ethyl monobromoacetate	1×10^{-4}
Hydrogen peroxide	$1·5 \times 10^{-2}$
Alkyl dimethylbenzyl ammonium chloride	5×10^{-2}
Sodium methyl *para*hydroxybenzoate	1×10^{-1}
Sodium dehydroacetate	5×10^{-2}

Ice cream[48].—In testing ice cream, along the lines just described for milk, it is not necessary to add any sugar. However, some commodities of this type may contain neither sufficient milk solids, nor enough fruit juice, making it imperative to enrich the product with 0·25% dehydrated yeast extract. Moreover, ice cream, though as a rule not showing a higher plate count than milk[48], seems to harbour other types of bacteria which make it necessary to use a somewhat higher degree of inoculation, *i.e.* the order of 10^6 cells/ml. This permits the test to be read after only 20 hr. at 25°C.

Canned cured meat products; sausage, fish products, etc.[51].—In the same way as in the testing of the products previously mentioned, a direct inoculation technique was first tried wherein taste or smell was to be used as the criterion of spoilage. Neither tests with *Bacillus* nor assays with *Pseudomonas* strains were successful, however.

Tests with the same strains using a hole-test technique[14] did not appear to be satisfactory either.

It is therefore necessary to start by extracting the preservative from the meat or other product. In order to obtain both acidic preservatives, such as boric acid, and alkali-sensitive agents, such as bromoacetic acid derivatives, parallel extractions 1:10 at *p*H 8 and at *p*H 3 are carried out.

Both extracts are sterilised by heating for 1 min. at 80°C. at *p*H 3, and then enriched with 2·5% of dextrose and 0·25% of dehydrated yeast extract and brought to *p*H 4. Inoculation is carried out at a level of 10^4 cells/ml. with *S. cerevisiæ*.

The threshold levels of detection in this technique are given in Table 7.

Table 7—Threshold Levels of Detection of a few Preservatives in Cured Meat Products

Preservative	*Threshold level* %
Ethyl monobromoacetate	1×10^{-3}
Benzoic acid	1×10^{-1}
Boric acid	5×10^{-1}
Hexamine	1×10^{-1}

Curing salts at the maximal levels encountered, *i.e.* 5% NaCl, 0·2% KNO_3 and 0·02% $NaNO_2$[51, 52],

do not interfere with the test, but only slightly retard fermentation.

But here, as elsewhere, in order to prevent false positives by all means, a special blank solution is used. It consists of 0·3% meat extract, 0·25% yeast extract, 0·5% NaCl, 0·002% $NaNO_2$ and 2·5% glucose.

Margarine[1].—Although The Netherlands food law permits the use in margarine of salt and benzoic acid at a level of $\leq 0{\cdot}2\%$, a few Dutch manufacturers have introduced so-called "natural margarines" containing either no salt, or no benzoic acid, or neither of these compounds. It was of interest to develop a test which would enable one to make sure that no other antimicrobial agents were used in those commodities, in place of salt and/or benzoic acid.

For this purpose the margarine is first of all aseptically heated to 42-45°C. to yield a serum. This serum is enriched with 0·25% of yeast extract and 2·5% of dextrose, as described earlier. If, by chemical analysis, benzoic acid appears to be present the serum is further adjusted to *p*H 7·0±0·2. Finally inoculation is carried out with 10^4 cells/ml. of *S. cerevisiæ* in the usual way. The tubes are read after 24-36 hr. incubation at 25°C.

When we tried, later, to apply the same test to ordinary margarines, it was of course necessary to dilute the sera obtained to a salt content of $< 0{\cdot}5\%$ NaCl, the maximum concentration fully tolerated by *S. cerevisiæ*. This often necessitated a dilution of 1:10, which considerably reduces the sensitivity of the test. We therefore tried to use other test organisms, especially (i) osmophilic yeasts as suggested by Bernaerts[53]; and (ii) salt tolerant bacteria.

The yeast strains tested were *Saccharomyces rouxii* strains, isolated in an outbreak of fermentation in candied fruits[54]. Unfortunately, these strains, although rapidly fermenting dextrose in the presence of 5% NaCl, appeared to be extremely sensitive to benzoic acid. One would therefore have to dilute the sera under investigation just the same, albeit for another reason than with *S. cerevisiæ*.

We then tried to use various salt-tolerant bacteria, especially *Str. fæcalis*[55], *Staph. aureus*[56, 57] and various *Bacilli*[58, 59], applying the acidimetric principle earlier used in testing beers for antibacterial antibiotics[33]. All the strains tested appeared to be much less sensitive (10-100 times) to preservatives than *S. cerevisiæ*, and so were of no use either.

Therefore, so far, the universal fermentation test remains the method of choice here also.

Discussion

The fermentation tests described above have practical value only if the levels of detection of the various preservatives in the diverse commodities are of a lower, or at most of the same, order of magnitude as the effective levels.

As a first estimate, on this basis, of the merits of the technique, the levels of detection of the esters of bromoacetic acid, in various foods, are compared in Table 8 with the concentrations used in practice.

Table 8—Comparison of the Levels of Detection of Esters of Bromoacetic Acid in Various Foods with the effective Levels reported to be used in Practice

Commodity	*Threshold level*	*Effective level*	
	%	%	*References*
Lemonades ..	2×10^{-3}	$6\text{–}150\times10^{-4}$	2, 81, 82
Milk	1×10^{-4}	$2\text{–}10\times10^{-4}$	83, 84, 76
Beer	1×10^{-3}	$1\text{–}3\times10^{-3}$	84
Meat products ..	1×10^{-3}	$2\text{–}5\times10^{-3}$	85

It may be concluded that in all four foods concerned the levels of detection of the bromoacetic acid derivatives are essentially lower than those used in practice. The method is therefore suitable in this respect.

For a second judgment, the levels of detection of various other preservatives in different foods are compared in Table 9 with effective levels used in practice, in so far as reliable data are to hand.

Here again the fermentation test appears to be a useful tool, since with its help these preservatives can be detected at the levels used in practice. With some agents, however, the safety margin is significantly lower than it was in the case of bromoacetic acid derivatives. Fortunately the preservatives concerned are all more or less stable compounds, which permits their concentration under vacuum or by extraction in those cases where higher sensitivity is required.

Summary

Some food manufacturers occasionally increase the stability of perishable foods which should not contain preservatives by adding low concentrations of very active antimicrobial agents which, in many instances (*e.g.* derivatives of bromoacetic acid, phenylmercury compounds and actidione), are highly toxic. Chemical methods for detecting each of the various preservatives are of course available, but these are cumbersome and often time-consuming. Furthermore, they cannot be used when the nature of the substance is not known beforehand.

The Kluyver fermentation test (1914) has therefore been adopted as a non-specific biological reaction for antimicrobial compounds in general.

In this test liquid products are directly inoculated with a suitable density of bakers' yeast (*S. cerevisiæ*): if effective levels of preservatives are present, fermentation is retarded or inhibited. Some commodities can be sterilised prior to inoculation; other products must be enriched to permit the development of the inoculum.

For use in testing solid foods, such as canned cured meat products, the commodity must be extracted and the extract obtained tested for antimicrobial agents in the same way. In the case of margarine, a serum obtained at 42-45°C. is tested.

Applications of this principle to the testing of lemonades, jams, beer, milk, ice cream, meat products and margarine are described. The levels of detection of the currently used preservatives are of an order similar to—but mostly lower than—the effective levels used in practice.

Table 9—Comparison of the Levels of Various Preservatives with the Effective Levels reported to be used in Practice

Preservative	Commodity	Threshold level %	Effective level %	References
Cetyltrimethyl ammonium bromide	Beer	5×10^{-4}	$5–10 \times 10^{-4}$	60
Boric acid	Meat products	5×10^{-1}	$3–25 \times 10^{-1}$	61, 62
Hexamine	Fish products	1×10^{-1}	1×10^{-1}	63
Hydrogen peroxide	Milk	$1{\cdot}5 \times 10^{-2}$	3×10^{-2}	64, 65

For the detection of specifically antibacterial antibiotics this "universal" fermentation test cannot be used. For this purpose a simple acidimetric technique, using *A. ærogenes* and *Str. fæcalis*, in parallel tests, has been developed.

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Standard for water testing

The British Standards Institution has published B.S. 2690:1956 "Methods of testing water used in industry."

When the proposal was first made to draw up standard methods for the physical and chemical examination of waters used in steam generation it was suggested that three groups of methods would be required. The first of these groups, already issued as B.S. 1427 ("Tests for water used in steam generation group A") describes tests which can be made even when ordinary laboratory facilities are not available. The present standard, while it includes some of the tests already given in B.S. 1427, consists mainly of tests which require laboratory facilities and call for chemical training on the part of the operator. The scope of the tests has also been widened, so that the methods given are more generally applicable.

The third group has been intended to serve research workers, but during the preparation of B.S. 2690 it became evident that the third group would be of little use. Many of the methods in this standard are directly applicable to research problems, and in those instances where special methods have to be devised these would probably be of such limited application that their publication in the form of a standard would be unlikely to prove of general interest.

Copies are obtainable from the B.S.I. Sales Branch, 2, Park Street, London, W.1. Price 17s. 6d.

Aluminium and Food

With aluminium now being used or contemplated for a growing variety of purposes in the food and chemical industries, it is not surprising that queries are frequently raised as to its suitability for specific applications. The purpose of a new booklet, "Aluminium with Food and Chemicals" is to assist in answering questions of this nature. It lists the reactions of aluminium with over 500 common food and chemical substances, and indicates where appropriate the extent to which aluminium has been used in the past. In addition, general information is provided on aluminium alloys and their characteristics, and on measures that can be taken to prevent or mitigate any attack that might take place. The publishers are Northern Aluminium Co.

Microscopical Technique for the Food Analyst–2

By S. M. Charlett, F.R.M.S.

In the concluding part of his article on the fundamentals of microscopic technique, the author gives directions for the preparation and use of temporary mounting agents. The appearance of some common fats and oils under the microscope is described and the properties of some permanent mounting agents are discussed. The first part of this article appeared in the March issue, p. 114.

TEMPORARY MOUNTS

THE temporary microscopical mount is the most widely used type of microscopical preparation. It is employed for the rapid examination of materials, either for quality, or for the detection of adulterants, for the characterisation of new materials, for the estimation of percentages of individual powders in mixtures, and for innumerable other purposes. Various reagents have been suggested as temporary mounting agents, the suggestions being based upon the ability of such agents to enhance and differentiate between various details, structural or otherwise, of the specimen being examined. Such differentiation may be produced by differences in refractive indices of the agent and the specimen, or may be due to temporary or permanent colour reactions.

Vegetable powders

This is one of the groups of materials most frequently encountered by the food analyst. It is frequently the practice to mount such powders in a little water and examine under the microscope for particle size, the presence of adulterants, and for other details. A little time spent on making a preparation, using simple reagents, will pay dividends in enabling the rapid and accurate assessment of quality and adulteration if present.

Chlor-zinc-iodide has been extensively used by the writer for the examination of these materials. This reagent may be prepared as follows:

Dissolve 5 g. potassium iodide in 14 ml. distilled water, and add 1 g. iodine. When the iodine is in solution, saturate with zinc chloride. Store in the dark, and make up afresh about once monthly.

To use the reagent, soak the material to be treated in a small amount of botanical iodine solution (1 g. iodine, 3 g. potassium iodide in 100 ml. distilled water) for about 5 min. Remove a small quantity of this material to the centre of a clean microscope slide, drain off as much of the iodine solution as possible, using a filter paper, add two drops of the chlor-zinc-iodide reagent, and cover with a clean cover glass. Place the preparation in a warm place, a 37°C. incubator is ideal but do not use an oven, for 10 min. and then examine under the microscope, using the $\frac{2}{3}$ or $\frac{1}{6}$ in. objective. If such constituents are present the following colour reactions may be observed:

Cellulose	...	Violet
Lignified tissue	...	Yellow
Starch	...	Deep blue
Protein	...	Brown
Cutin or Suberin	...	Yellow-brown

For temporary mounts the chlor-zinc-iodide technique is by far the most useful for the differentiation of various elements by staining. Other reagents have been suggested by various workers, but most of these tend to be rather specific. One per cent. phloroglucinol in 70% alcohol, for instance, may be used to differentiate lignified tissue, but will not show other elements. Foster[1] showed that a combination of tannic acid and ferric chloride would effectively stain cell walls, whilst Garcia-Blanco[2] used tetrabromosulphophthalein as a differential stain for cellular structure, but the writer has found that the results obtained with the use of such stains tend to be variable and unreliable, and still prefers the chlor-zinc-iodide method.

For those who prefer to study the structure of vegetable powders in the unstained state other mounting agents are available. The usefulness of such agents depends upon their ability to render the subject more transparent, and to make structure more visible by difference in refractive index. One such reagent is a solution of 64 g. chloral hydrate in 40 ml. distilled water. This is quite simply used. A small quantity of the material being examined is dispersed in about twice its volume of the chloral hydrate solution in the centre of a slide. Using the *Nichrome* loop mentioned under *Apparatus*, a loopful of the suspension is transferred to two drops of chloral hydrate solution in the centre of a clean slide, dispersed, and covered with a clean cover glass. After about 10 min. microscopical examination will reveal that the reagent has rendered the material semi-transparent, and by virtue of a great difference in refractive indices has enhanced the structural characteristics. The writer[3] devised a simple technique for the mounting of vegetable powders, which involved the use of the following reagent:

Phenol	...	15 g.
Lactic acid	...	15 g.
Glycerine	...	35 ml.
Distilled water	...	25 ml.

For temporary preparations of vegetable powders the technique is quite simple. A little of the material is dispersed in about twice its volume of the reagent, a loopful of the suspension is transferred to two drops of fresh reagent and again well dispersed, and the slide placed in a warm spot for about 10 min. (a 55°C. incubator is ideal). At the end of this time the preparation is covered with a clean cover glass, and examined under the microscope. It will be seen that the specimen has been rendered very transparent, and the high refractive index of the

mounting agent will show the cellular structures in detail. The advantage of this reagent is that the presence of glycerine prevents evaporation taking place too rapidly, enabling such mounts to be kept for more than just a few hours, in fact the longer the reagent is given to act, the better the results obtained.

Flour and starches

Probably the next most important group of powders examined by the food technologist are the flours and starches. Butcher[4] dealt in some detail with the microscopy of flour, and outlined some methods of differentiating between them, but probably the most comprehensive article on this subject was presented by Wittmer.[5] This worker found that rye flour mixed into wheat flour could be detected by dispersal in Indian ink. When examined, wheat flour particles appear sharp and clear, whilst the rye particles appear to swell and become indistinct. Rice starch in flour may be detected by shaking 10 g. of the flour with 300 ml. of distilled water, allowing to stand and decanting after 5 min., and repeating the process twice on the residue. Finally the residue is treated with a mixture of equal parts of 1% methylene blue and 1% eosin, in 25% alcohol, for 10 min. The treated material is then washed in distilled water for 15 min., and finally mounted on a clean slide in distilled water. Under the microscope rice starch particles show up blue-green, and wheat starch colourless or pale yellow. Soya flour in wheat flour may be detected by treating the material with iodine solution, made up as described under *Vegetable powders*. (Note that *iodine* solution, and not chlor-zinc iodide, is used in this technique.) By this method wheat flour particles stain deep blue, whilst soya flour particles appear yellow to yellow-brown.

Starches need to be treated a little differently to flours. Many workers use simple distilled water mounts, but in the writer's opinion such mounts do not afford good clear observation of the hilum, surface markings, or granule edges. The writer finds that mounting in liquid paraffin affords good differentiation of the markings and edges. It is essential in all microscopic observations, and particularly so in the case of starches, to keep the amount of material in the field of observation to a minimum. This allows the observer to have single particles for observation, rather than clumps in which the individuals are indistinguishable. This may be accomplished by the simple expedient of pre-diluting the material under examination with the mounting agent, and has been described earlier under *Vegetable powders*. Thus when mounting starch in liquid paraffin a small amount of the specimen should be well dispersed in twice its volume of the reagent, and a loopful of the suspension transferred to a clean slide where it is further dispersed in two or more drops of fresh liquid paraffin. After covering with a clean cover glass the preparation may be examined under the microscope, when it will be found that the granules are well separated, affording the observer the opportunity to observe intimate details quite easily.

Starch may be stained for the purposes of identification or more detailed observation. One of the best known agents for this purpose is an aqueous solution of iodine made up as described earlier. This reagent will enable starch to be detected, and will give a good indication of the outline of granules, but it obliterates completely the hilum and any other surface markings, which are necessary for the identification of individual starches. Staining the granules with 0·1% aqueous methylene blue will be found to produce excellent results. Striæ are emphasised, the edge is rendered more distinct, and the hilum becomes definite and conspicuous. Unfortunately methylene blue does not give very good photographic results when used to stain starch granules, and the writer has found that the chlorazol fast red "K" originally suggested by Butcher[6] gives far more accurate results, producing good photographic definition of striæ, edge and hilum.

Miscellaneous crystalline materials

The analyst may be called upon to examine a variety of crystalline substances, with the object of estimating purity and detecting any foreign materials or contamination. Such substances may be water soluble or insoluble, or may be affected by some or all of the common mounting agents, and the selection of a mountant for the microscopical examination of these must be dependent upon two important factors. Primarily, of course, the question of solubility must be considered, as the solution of the specimen in the mountant renders microscopic examination a trifle superfluous. Secondly the refractive index of the mountant as compared with the material to be examined is of prime importance. As has been mentioned earlier, the greater the difference in refractive index of mountant and specimen, the greater the differentiation of detail. This is particularly so in the case of many crystalline materials where a close similarity in this property can lead to the specimen being virtually invisible when examined under the microscope. It will be found necessary to experiment with various agents for the purpose of mounting such subjects, and for those who may find it of interest or use, a list of the refractive indices of various agents which have been found useful as microscopic mountants is given below:

Mountant	*Refractive Index*
Air (dry)	1·000
Absolute ethyl alcohol ...	1·361
Acetic acid (glacial) ...	1·371
Aniline oil	1·586
Benzene	1·504
n-Butyl alcohol	1·399
Carbon bisulphide ...	1·630
Carbon tetrachloride ...	1·460
Castor oil	1·490
Clove oil	1·533
Ethylene glycol	1·432
Isobutyl alcohol	1·397
Methyl alcohol	1·328
Olive oil	1·473
Turpentine	1·470
Water (distilled)	1·336

Fats and oils

To complete this section on temporary preparations it was felt that a few brief notes on the prep-

aration of fats and oils for microscopical examination would be of interest. Many workers do not believe that microscopical examination of fats can yield any useful information, it being held that on hardening, fats do not assume definite crystalline forms. It has been shown by X-ray analysis, however, that controlled crystallisation of various fats and some oils can produce quite distinct and definite crystal forms which are characteristic for the individual groups. The best method of obtaining characteristic crystal formations is by inducing rapid crystal formation from a saturated solution of the material at crystallising temperature. The usual technique, and one which has been found to give accurate and reproducible results, is to dissolve some of the sample under test in about 4 or 5 times its own weight of a selected solvent and allow the solution to set at a temperature conducive to rapid crystal formation. The temperature for various fats must be determined by experiment, but the writer has found that samples of hardened palm kernel oil of melting point 35°C., dissolved in about 4 times their weight of chloroform and allowed to crystallise at 15°C., will produce characteristic, needle-like crystals, which are readily identified under the microscope.

Numerous solvents have been suggested by workers for the production of crystals of fats. Methyl alcohol, ethyl alcohol, petroleum ether, methyl and ethyl acetate, amyl and butyl alcohol and others. For most purposes the writer has found butyl alcohol to be the most consistent and effective reagent.

Such crystals, when grown in test tubes or small beakers, may be mounted for examination by transferring them to microscope slides and mounting in olive or clove oil. For the transfer it is best to use the *Nichrome* wire loop, and in this way it is possible to include the minimum of solvent with the crystals, thus preventing any undesirable effects upon the mountant used. Care should be taken to avoid damaging crystals, but it is still necessary to ensure even distribution when mounting so that individuals may be seen. This is best done by taking as small a quantity as possible in the first instance, and then dispersing gently in the mounting agent with the wire loop, or a histological needle, and using an eye lens to observe dispersion. If the crystals are large, or appear unduly fragile, it may be best to mount them in a micro-slide cell. In this way it is possible to avoid crushing or distorting the characteristic formations with the weight of a cover glass.

In many cases the technique described above will not give satisfactory results. Oils, for instance, will not crystallise, and some of the low melting point fats may prove difficult. In such cases, characteristic crystals may be formed by reaction with selected reagents. Sodium hydroxide, potassium hydroxide, mixtures of these, ammonium hydroxide, phenylhydrazine, and many other reagents have been used to produce crystals. Of these, potassium hydroxide has been found to give the most reproducible results, usually in the bench reagent strength of 10%. The method usually employed with these reagents is direct precipitation on to a clean microscope slide. This is quite simply done. A little of the liquid oil, or melted fat, is placed to one side of the centre of a clean slide, and about 5 mm. away is placed a drop of the reagent being used. A clean cover glass is placed over the two drops, when it will be found that they spread and merge with each other. Observation under the microscope will show that after about 10 min. definite crystal formation is visible at the junction of the two liquids. Gentle warming in a 37°C. incubator will accelerate the reaction if so desired, but care must be taken to warm for as short a time as possible to avoid distortion of the crystal formations.

In addition to the above techniques for microscopically examining fats and oils, useful information may be obtained by examining the crystallised fatty acids of such products. Such acids, when thoroughly washed, may be dissolved in one of the solvents mentioned previously and recrystallised on to a clean slide. Some may crystallise spontaneously, but those of lower melting points may need chilling before characteristic crystals are obtained.

A great deal of practical experience is necessary for the microscopical differentiation of oils and fats, and there is not room to give detailed explanations of characteristics. As was mentioned at the beginning of this article, there is a vast amount of literature on the microscopical appearances of many food products, fats and oils included. The appearance under the microscope of some of the more common types is noted in Table 1.

PERMANENT PREPARATIONS

As its name implies, the permanent preparation is intended to be capable of being stored indefinitely without any undue deterioration or alteration in microscopical appearance. Such a slide is generally prepared for one of several reasons. Firstly, there is the need to preserve for recording purposes any interesting or unusual specimen which may be encountered in normal working, either because of adulteration or for the preservation of peculiarities. Secondly, from experience of the controversies which can arise over the appearance of various materials under the microscope, the writer feels that all laboratories should maintain a reference file of permanent slides of all the materials likely to be examined in this way. The material used for making such a preparation should be an assured standard, and should be accepted as a reference for the comparison of further samples. As a final point, all laboratories find it necessary to train personnel, and there is no better way of studying the normal appearance of materials, and the variation from normal which may be met, than to use the permanent reference file of standard material. Inexperienced personnel may study such slides at their leisure, and thus familiarise themselves with the normal materials, and with

Table 1. Appearance under Microscope of Some Common Fats and Oils.

Specimen	*Treatment*	*Microscopical Appearance*
Hardened palm kernel oil	Direct crystallisation on to slide	Minute balls of very fine needle-like crystals. Only visible under high power
Coconut oil	Direct crystallisation on to slide	Heavy central portion, with fine needle-like crystals radiating like spokes of a wheel
Teaseed oil	Crystallised on slide, using 1% KOH in butyl alcohol	Fan-shaped tufts of needle-like crystals, resembling dart flights
Lard fatty acids	Recrystallised on to slide from butyl alcohol	Large, elongated crystals of stick-like appearance
Cottonseed oil fatty acids	Recrystallised on to slide from butyl alcohol	Large deposits. Heavy central growth with thick radiating spicules
Rice bran oil fatty acids	Recrystallised on to slide from butyl alcohol	Distinctive deposit of chisel-shaped crystals in fern-like pattern
Palm oil fatty acids ...	Recrystallised on to slide from butyl alcohol	Small bundles of crystals, resembling a fasces, but with no definite pattern

possible adulterants, the observer quickly acquiring the ability to differentiate between these.

Before outlining the techniques which are used for making permanent preparations, it may be of some interest to consider the "desirable attributes" of a permanent mounting agent, as discussed by Cowdry[7] and Shillaber.[8] These may be briefly summarised as follows:

1. A refractive index sufficiently different from that of the specimen to allow accurate resolution of internal or external structures.
2. Should be clear, colourless, and free from any tendency to become acid or discoloured by age.
3. Should be soluble in normal reagents, such as water, xylene, benzene, etc., so that normal techniques may be employed.
4. Should be quick setting, but without any tendency to cracking or granulation, and should be adhesive to glass.
5. Should be stable, and inert to objects mounted in it, and should have a high enough softening point to allow the use of a microprojector.

Although under *Temporary Preparations* various materials were considered separately, permanent methods are a little more versatile. Once the desired specimen has been obtained, whether it be vegetable powder or starch, it is possible to make a permanent preparation with a common reagent and technique. This is not always so, sometimes it is best to use a special method for a particular specimen if it is wished to preserve a definite characteristic, but broadly speaking the methods of permanent mounting are reasonably interchangeable.

Canada balsam is one of the oldest permanent mounting agents, and its use is quite simple. Having ensured that all moisture has been removed by one of the methods described earlier, a little of the specimen is allowed to soak in xylene for 15-20 min. A small quantity of the material so treated is transferred to the centre of a clean slide and dispersed in a drop of thin, neutral Canada balsam in xylene. A thoroughly cleaned cover glass is held immediately above the dispersed material and about 5 mm. away from it, and is allowed to drop directly on to the slide. This method of placing on the cover glass ensures that no air bubbles are trapped beneath it; the presence of such bubbles will render the mount almost useless for comparison purposes. Some workers suggest that the cover glass should be placed over the mount so that one edge rests on the slide and the opposite edge is supported by a needle. This is then slowly lowered into place. Although the writer agrees that this latter technique also prevents the inclusion of air bubbles, it must be noted that the addition of the cover glass in this manner does tend to produce clumping of powdery material by capillary action between slide and cover glass during the process.

The writer[9] has described a simple technique for the mounting of reference starch standards for comparison purposes, and this has been extended to include the mounting of milk powders, pigments, and other materials. In this technique the procedure was to prepare an initial dilution of the sample, as recommended earlier, by dispersing a small quantity in about an equal volume of *Durofix* household cement. After mixing well with a needle or small scalpel, the mixture was spread over the surface of a clean slide and allowed to dry. A small portion of the dried suspension, about $\frac{1}{8}$ in. square, was removed to about four times its volume of fresh *Durofix* in the centre of a clean slide, well dispersed by gentle use of the needle or scalpel, and then covered with a clean cover glass as described above. The preparation was then allowed to dry, and microscopical examination revealed the particles evenly dispersed, and showed that in general they had settled into a common optical plane, which allowed microscopic observation without the continuous changes of focus so often necessary in such cases.

Vegetable powders may be treated in this fashion, but in the section on temporary preparations a method was described for the treatment of such powders with a phenol-lactic acid-glycerine reagent. Such treatment can be extended to the preparation of permanent mounts in the following manner. The material is treated as described, and a small quantity is then dispersed in two drops of *glycerine jelly mountant* in the centre of a clean slide. This is then covered with a clean cover glass and placed in a 37°C. incubator for about 10 min. to allow any air bubbles to escape from beneath the cover glass. The slide is then removed from the incubator and placed in a cool spot to set. When hard, the mount is ringed on the turntable to prevent drying out of

the mountant; gold size may be used, but black cellulose lacquer will be found perfectly satisfactory and will give a better finish to the mount. Glycerine jelly mountant may be prepared to the following formula:

Gelatine (powder)	...	8 g.
Distilled water	...	40 ml.

Dissolve the gelatine by gently warming, when completely dissolved add:

Glycerine	...	50 ml.
Thymol crystals	...	1 g.

Warm gently and stir until the flaky precipitate produced by the thymol disappears. Store in a closed container. The mountant will keep indefinitely provided that the water is not allowed to evaporate. The use of glycerine jelly has the disadvantage that the mountant is very susceptible to heat, sometimes melting at summer temperatures. Consequently other permanent agents have been devised. Only one other mountant has been found that may be used in conjunction with the phenol-lactic-glycerine agent, and this is the polyvinyl alcohol mountant of Huber and Caplin,[10] which was originally devised for the mounting of dermatological preparations. It may be prepared in the following manner:

> A stock solution of polyvinyl alcohol is made up by dispersing 15 g. of the powdered reagent in 100 ml. of distilled water. The suspension is then heated to about 80°C. on a water bath, stirring gently and ensuring that all lumps have been reduced. The solution will be found to thicken to the consistency of treacle, and it is then removed from the bath and filtered through a layer of cheese cloth or a fairly fine sieve. The filtrate is then reheated to 80°C. until clear, and then transferred to an airtight container in which it will keep indefinitely. Just prior to use, 22 parts of lactic acid are well mixed into 56 parts of polyvinyl alcohol solution, and is *followed* by 22 parts of liquefied phenol. The final preparation should be used within 4 hr., otherwise it will become too viscous to use and will have to be discarded.

When using the above reagent for mounting material treated with the lacto-phenol-glycerine clearing agent, the technique is quite simple. A small quantity of the treated sample is transferred to the centre of a clean microscope slide and any excess of clearing agent removed with a piece of filter paper. Two drops of the P.V.A. mountant are added, the preparation covered with a clean cover glass, and the completed mount put aside in a warm place to set. It should be preferably left undisturbed for at least 24 hr., and will not harden completely for about 2 weeks.

This mountant may be used for the preparation of permanent mounts of materials which have not been cleared or specially treated in any way, and has the advantage that it is not necessary to *dehydrate* such materials, as must be done when using other plastic mountants which are dissolved in xylene or benzene. Thus vegetable powders, and other slightly moist materials, may be mounted in this reagent without any special treatment.

A final general purpose permanent mounting agent which may prove of interest to other workers is the agent known as *Clarite*. First suggested as a microscopical mounting agent by Groat[11] under the name of Nevillite, this material was the subject of an interesting article by Rosenbaum.[12] *Clarite* is a cycloparaffin resin, and is soluble in most organic solvents such as xylene, benzene, toluene, etc. It is an extremely clear mountant, and has a fairly high refractive index. A modification known as *Clarite X* is also available, and this has a higher refractive index. Table 2 compares the properties of these mountants with those of Canada balsam. From this table it can be seen that whilst *Clarite* and *Clarite X* compare favourably in refractive index with Canada balsam, they are superior in heat resistance and resistance to the effects of age or exposure to light.

Table 2. Properties of Mountants

Property	*Clarite*	*Clarite X*	*Balsam*
Melting point °C.	*ca.* 150	*ca.* 150	*ca.* 60
Refractive index	1·54	1·56	1·54
Colour	Water white	Water white	Amber
Effect of age and light ...	nil	nil	Yellowing

The use of these mountants necessitates dehydration of the material being mounted, which may be done with the use of increasing grades of alcohol as described under *Dehydration*. After being dehydrated the material should be soaked in xylene for about 30 min., preferably in a covered watch glass. A drop of the xylene containing some of the material should then be transferred to a clean slide, the xylene allowed to evaporate, and the deposited material dispersed in two drops of *Clarite* in xylene. This is in effect the dilution technique described earlier, and ensures that the preparation is not overcrowded. Large specimens may be mounted in micro-cells, which are then filled with *Clarite*, and such are the properties of this agent that even in thick layers no undesirable optical effects are produced, and the specimen has the appearance of being embedded in solid glass.

Clarite mounts should not be overhandled for about 48 hr., after which they may be treated normally, but, as in the case of P.V.A. mountant, they require about 2 weeks to become really hard.

The permanent mounting of various crystalline materials presents quite a variety of problems; the possibility of detrimental effects by the mountant, or of the crystals being dissolved in the mounting agent solvent, must all be considered when selecting a mountant for this purpose. The writer can only offer advice, and it is not possible to make any definite recommendations.

If the crystals are not likely to be affected by the mountant or solvent, then it is suggested that water-soluble specimens be mounted in *Clarite*, and water-insoluble specimens be mounted in either *Clarite* or P.V.A. mountant. If the specimens are likely to be affected by these reagents, then it is best to choose a mountant from the list given above, with refractive indices, mount the specimen in it, and seal the edges of the cover

glass with gold size. This means converting a temporary mount into a permanent one, but it is the only solution.

Permanent preparations of fats and oils, or the typical crystal produced from these by reaction with selected reagents, again need careful consideration. The writer has made successful use of glycerine jelly for such purposes, and indeed this has proven the only possible solid mounting agent for the permanent mounting of such materials. It is quite possible to use liquid mountants; many workers have suggested olive oil, cedar wood oil, glycerine, and other agents. If properly sealed, such mounts are quite satisfactory and will retain all characteristic properties for quite long periods. The only real objection is that if the slides so prepared are handled without due care, all the specimens will drift to one edge of the cover glass and there form a mass that has no features whatsoever, and is of no value as a reference slide.

The scope of food laboratory microscopical technique is vast, and it has only been possible to touch upon the fringes here. Such subjects as differential staining methods and the use of ultra-violet light in microscopy would occupy as much room again as this article, but it is hoped that at some future date it may be possible to present brief notes on such subjects.

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Frozen Foods for G.I.s

THE days when the soldier cooked his meals over his own campfire are almost over, certainly for G.I.s. In his introduction to this report* of a symposium on pre-cooked frozen foods, Col. J. D. Peterman announces that the Army's Quartermaster Institute is studying not only pre-cooked frozen food but pre-cooked frozen meals.

The foods were developed during the last war as a result of the increased range of transport and bomber aircraft and the fatigue that accompanied these extended missions. The American Navy was the first to adopt the foods for use aboard patrol aircraft and is currently interested in their applications for submarine feeding, etc. Their use is limited in the U.S. Army, the main problems being stability, formulation of menus and the design of equipment for thawing and heating such foods under operational conditions.

The purpose of the symposium, which was attended by research workers from universities, government and industry, was to explain present knowledge of pre-cooked frozen foods and to point out the problems remaining to be solved.

The morning session was devoted to the use of pre-cooked frozen foods in the armed services and to their preparation and processing. Research work in the U.S. Navy, for the Air Force In-Flight Feeding Program, and the use of pre-cooked frozen products in hotels, restaurants and railway dining cars were described. Frozen meat products and rice, the texture stabilities of sauces, gravies and other frozen foods and their nutritive value were discussed and a paper was read on monosodium glutamate and food flavours.

The afternoon session was devoted to quality control, stability and microbiological aspects of pre-cooked frozen foods. Papers included discussions on keeping quality, and current microbiological quality standards.

* *Pre-cooked Frozen Foods*. 1955. Pp. v+76. Free from the Q.M. Food and Container Institute for the Armed Forces, 1819, West Pershing Road, Chicago 9, Illinois, U.S.A.

To the Editor . . .

Brisling, Sild and Sardines

SIR,—I have read your reader's letter on the above subject (last month p. 160) with interest. The legal action referred to took place over 40 years ago, rather than the 20 years mentioned.

However, this point does in fact make the two statements about brisling and sild sardines correct. The first was, "The factory will handle brisling and sild sardines." I maintain that apart altogether from the United Kingdom labelling regulations the fact that some 40/50% of the production is actually labelled British Brisling Sardines or British Sild Sardines and exported to almost every country in the world suggests conclusively that my company are actually canners of brisling and sild sardines.

So much for the first reference. The second is somewhat more intricate: "Forty years ago, when the Leeds cannery first went into production, all the canned brisling and sild sardines were imported." This statement is also correct because the decision in the law case mentioned was promulgated in 1915 and all my company's production and all Norwegian imports up to that year were labelled sardines.

The reference to the labelling regulations in the U.K. is, of course, correct but I would stress that they apply only in this country.

In support of my contention that my company are brisling and sild sardine canners, I would point out that all Norwegian canners so describe themselves and their products. The fish machinery and processes used in this country are identical with this similar Norwegian industry.

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Advances in Food Technology

FISH

Fermented Fish Sauce

Soya bean sauce is widely used in Indonesia to flavour cooked rice and to prepare tasty side dishes to rice meals. Soya bean is often mixed with fish or shrimp paste to give it specific taste, but fish sauces, consisting entirely of hydrolysed fish meat, are unknown in most parts of Indonesia. Products like the *nuoc mam* of Cambodia and the *nam pla* of Thailand would probably be easily sold, if produced locally.

A sauce is produced in Borneo which has its own specific taste and composition and is made entirely by hydrolysis of fish protein. In Borneo, brackish water fish (*Clupea, Stolephorus* and *Leiognathus* spp.) and fresh water fish (*Osteochilus, Puntius* and *Ctenops*) are considered equally suitable for hydrolysis. Wooden casks, 120 cm. (47½ in.) in diam. at the bottom and 160 cm. (63 in.) at the brim, are filled with small fish up to a height of 120 cm. The fish are added in 5 layers of equal thickness, the bottom layer containing salt in a proportion of one-fifth of the weight of the round fish. Increasing quantities of salt are added to the other layers, the layer of salt below the top layer of fish containing one-third as much salt as the weight of the fish. The top layer of fish is covered with a thin layer of dry salt and covered with a lid made of split bamboo. Stone weights press down the lid during the process of fermentation, which usually extends over a period of 6 months but might be prolonged to a year, if a high quality product is required. The fermented liquid is drained off by means of a cock, placed about 10 cm. (4 in.) above the bottom of the cask. After filtering and filling into earthenware jars or bottles, the sauce is ready for commercial use. When a series of fermentation casks has been tapped empty, the fish waste is collected in one of them, fresh salt is added and fermentation started again to obtain a second-grade product. The final residue is filtered and the sauce used domestically; the solid wastes are utilised as pig food.

In certain fishing centres of Borneo, fish sauce is also made by boiling and filtering the liquid obtained in processing fermented salted Thunnids (*Rastrelliger* sp., in Indonesian: *peda*); this product is sold in large quantities all over the Far East.—*World Fish Abst.*, 1955, Sept.-Oct., 31.

MEAT PRODUCTS

Plastics for Meat Packaging

Being transparent, vapour-proof, flavour-proof and grease-proof, plastics are well suited for food packaging. But they do not afford protection for moist food products particularly liable to microbial attack. A keeping quality significantly exceeding that of unpacked perishable meat products can only be obtained if the packaged goods are sterilised and if re-contamination is prevented by hermetic closure. Generally a further prerequisite to success is the use of plastic foils which are sufficiently vapour proof, and free from plasticisers. The heat treatment must be governed by the same principles as those governing the sterilisation in cans and glass containers. As yet there seems to be no plastic foil available which meets all the requirements in full, though there can be little doubt that such a product will be found. In the meantime food manufacturers should exercise caution in the use of such materials.—M. von Schelhorn (Institute for Food Technology and Packaging, Munich), *Die Fleischwirtschaft*, 1956, **8**, 59.

CANNED TOMATOES

Blown Tomato Cans

Tomatoes canned in Spain during 1954 have shown an exceptionally high percentage of blown cans. Research carried out at the Juan de la Cierra Institute, Murcia, has traced the main cause of this phenomenon to the exceptional dryness in the autumn of 1954 which has caused the prevailing bacteria (mainly *Clostridium Tertium*) to form spores able to survive the sterilisation heat and to lead to subsequent fermentation and the formation of gases inside the cans. It is recommended that the tomato cans should be preheated before sealing to deliberately provoke the germination of the spores so that the bacteria can be killed during subsequent sterilisation.—*Información Conservera*, 1955, **3**, 17.

BREAD

Moisture and Freshness

Among the factors that may conceivably affect the successful preservation of bread freshness by freezing is the possibility of important changes in normal moisture distribution caused by freezing, defrosting, or storage in normally dry refrigerated spaces. Moisture differences are related to sensory perception of staleness in bread. This distribution may be altered by freezing, so a comparison was made of the normal moisture distribution in freshly baked bread with that in frozen and frozen-defrosted bread.

The results showed that frozen bread retained the moisture distribution of freshly baked bread for at least 7 weeks of storage at 0°F. (−18°C.) and 20°F. (−7°C.). A significant difference in moisture distribution between freshly baked round-top and sandwich bread was found only in the crust region.—J. W. Pence *et al.*, *Food Tech.*, 1956, **10**, 2, 76.

SUGAR

Moisture and Crystallisation

Amorphous (metastable) sucrose and glucose powders were exposed to relative humidities ranging from 4·6 to 33·6% at 25°C. At humidities lower than about 12% for sucrose and 5% for glucose, moisture equilibrium was attained and practically no crystallisation occurred in nearly 3 years. A vapour pressure isotherm was evaluated for sucrose-water solutions from 0 to 100% sucrose at 25°C. At higher humidities the absorbed water initiated crystallisation of the sugars with subsequent release of moisture to yield essentially anhydrous materials. The rate of crystallisation of amorphous sucrose, evaluated from changes in the moisture content, followed an exponential law with respect to time, after an initial induction period. This period was interpreted to be the time for a build-up of sufficient nuclei to initiate an appreciable rate of crystallisation.—B. Makower and W. B. Dye, *Ag. and Food Chem.*, 1956, **4**, 1, 73.

WINE

Effect of Heat on Colour

The extraction of sufficient colour from the grapes to produce adequately coloured red wines has always presented a problem. Where the alcohol content is low and the contact time short, as in the production of port wines, well-coloured products are rare unless the must (skins, seeds, pulp and juice) is heated. H.T.S.T. processing treatments in the canning industry have been found to do the least damage to the quality of the product and accordingly the treatment was applied experimentally to wine production. Changes in the organoleptic characteristics of the wines, particularly colour stability, were followed during ageing for periods of 16 to 55 months.

Heat treatment of musts fermented on the skins slightly increases the red hue, increases the saturation and markedly decreases the brightness. Increased treatment results in a slight progressive decrease in redness and a significant decrease in colour density. Heat treatment of musts fermented off the skins has little effect on either hue or colour density. A retention time on the skins of 0·58-24 hr. results in a slight increase in both redness and colour density. A retention time of 72 hr. with fermentation has the opposite effect. Pressing lessens the red hue and, on ageing, the colour density. Pectinol O decreased redness and colour density in two lots, had the opposite effect on a third, an erratic effect on the fourth and, with press wine, had no effect on the hue but a significant effect on the colour density.

Ageing resulted in a more or less marked decrease in the red hue as well as in the colour density. In some lots it also caused a reversal in the initial effect of the treatment on both.

Fermentation on the skins of heat-treated musts produced wines definitely inferior in quality. Pressing had the same effect. None of the other treatments materially affected the taste or aroma of the wines.—H. W. Berg and G. L. Marsh, *Food Tech.*, 1956, **10**, 1, 4.

OLIVE OIL

Spectrophotometry

On the basis of earlier research work which had established the greater optical transparency of virgin olive oils compared with refined oils, the Olive Oil Research Laboratory at Sfax, Tunisia, has investigated the absorption coefficients of olive oils with a view to using them as a means of appraising the quality of given oil mixes. From nearly 1,000 specimens of olive oil sampled during the 1954-55 campaign, it has been possible to confirm the assumption that these absorption coefficients can be used as quality criteria and, in fact, for the detection of certain impurities contained in the oil. Spectrophotometric research thus becomes an important means of assessing the quality and composition of olive oil—A Uzzan, *Oléagineux*, 1955, **11**, 27.

SAUSAGES

Weight Losses of Glass-packed Products

In recent years, German sausage manufacturers have marketed sausages packed in vacuum-topped glass containers. In spite of correct filling weight, a subsequent loss in weight has often been experienced which has led to legal actions being taken against the manufacturers concerned. Tests were carried out, and it was found that while canned sausages in brine regain their initial weight except for about 10%, this is not necessarily the case with sausages kept in vacuum-topped glass containers, as the lack of compensating pressure by the brine tends to favour the formation of air bubbles and the deposition of fat, resulting in short weight. The difficulties can only be overcome by applying a higher filling weight and accurate weight control at all stages.—E. Leinhop, *Die Fleischwirtschaft*, 1955, **7**, 665.

MONOSODIUM GLUTAMATE

Influence on Taste

Three types of experiment were designed to test the hypothesis that monosodium glutamate (M.S.G.) affects flavour perception by altering gustatory acuity. Absolute and differential thresholds were measured with and without a prior mouth rinse with M.S.G. The effect of the presence of M.S.G. in solutions of the basic tastes on subjective intensity was determined.

M.S.G. raised the absolute thresholds for *sweet* and *sour*; it did not significantly alter the differential thresholds for *salt* and *bitter*. It increased the subjective intensities of *salt* and *bitter*, but had no effect on sour and sweet tastes.

No consistent pattern of the effect of M.S.G. emerged. The results do not support the hypothesis that M.S.G. acts as a general intensifier of flavour and suggests no other hypothesis, except the general one that M.S.G. is simply another seasoning.—F. J. Pilgrim *et al.*, *Food Res.*, 1955, **20** (4), 310.

Machinery and Equipment

MECHANICAL SEALS

A 20-min. film describing the *Flexibox* mechanical seal has been produced by Flexibox Ltd. Called "Pumps Without Tears" the film explains how mechanical seals are used to deal with the problems of leakage along the rotating shafts of process pumps.

About half of the film is devoted to a special animation treatment which gives a complete inside view of the components. All the special features are added to the basic seal, stage by stage and demonstrated.

"Live shooting" shows how a seal is fitted to a typical pump. The last part of the film is devoted to a tour of the places in which these seals operate *e.g.* in pumps for the food and drink industries, in industrial, domestic and commercial refrigerators, power plants, atomic plants, etc.

ANAESTHETISING PLANT

Based on the Hormel method of anæsthetising pigs before slaughter, a Danish firm of consulting engineers has designed a new type of plant, "the circular tunnel," for anæsthetising smaller killings (under 240 pigs per hr.) with carbon dioxide. The plant was described by its designer, Mr. N. E. Wernberg, to leading British bacon curers and meat processors at a meeting organised by the Alexandra Separator Co. Ltd., who are handling enquiries for the equipment in this country. Mr. Wernberg's lecture was followed by films comparing pig slaughtering without anæsthesia, by the Hormel method, and by the new Danish method.

The plant has been thoroughly tested in Denmark's largest bacon factory, Andels-Svineslagteriet i Kolding, where last year nearly 300,000 pigs were effectively immobilised before slaughter. The plant consists of a circular flight conveyor, one end of which descends into a chamber filled with a mixture of air and carbon dioxide. This gas is heavier than air and remains in the lowest part of the circular tunnel. The pigs are admitted individually through a gate to the conveyor which is divided into 9 or 10 sections by means of separating stanchions. When the gate is closed it operates an electric contact which starts the conveyor. Another contact acts as a limit switch which stops the conveyor before the stanchions reach the gate and prevents the pigs from being crushed in case the gate should not be closed. The pigs fall unconscious after exposure to the CO_2 for 5-10 seconds and stay immobilised for about 1 minute. If not slaughtered they will awake after about 3 min. and, it is claimed, are willing to repeat the trip without any objection.

Shackling and killing the pigs is done in the ordinary way, but the sticking hoist has been arranged so that the pigs slide gently off the conveyor table and are hoisted to the bleeding rail without any jerks.

Should the conveyor stop for any reason while the pigs are in the CO_2 chamber, a steam ejector will, within a few seconds, draw the CO_2 mixture from the chamber and the pigs may be removed through openings in the top of the chamber.

The CO_2 is delivered through reduction valves from 2 batteries, each consisting of a number of cylinders containing sufficient gas for one day's killings. The CO_2 consumption is about 100 g. per pig. The CO_2 concentration in the chamber is 65% and is regulated by an electric contact on the gas indicator which operates a solenoid valve on the supply line. Two signal lamps indicate when the concentration diverges from the correct value.

Modern machinery for sausage manufacture was seen in action at the Daily Mail Ideal Home Exhibition by these Russian visitors to the Foodtech stand. They are members of the U.S.S.R. trade delegation to the U.K. and were shown over the stand by the managing director of Foodtech, Mr. P. Hilgeland.

PYRO-SERVOGRAPH

A new pyro-servograph incorporating the advantages of a D.C. potentiometer at about half the cost has been introduced by Fielden Electronics Ltd. The price of a single point recorder is £87 10s. while the instrument is available as a four-point recorder at £125 10s.

The new instrument is a temperature recorder which operates in conjunction with thermocouples and can be supplied for use with either base metal or precious metal thermocouples, in various ranges from 0-300°C. upwards. The instrument has been designed for industrial use and the motor-driven pen is positioned by an electrical servo system from a high grade electrical meter. Automatic cold junction compensation is provided and the equipment has an accuracy of ±1%. It is, therefore, suitable for use in many of the applications which would otherwise necessitate a D.C. potentiometer, for although the accuracy is not quite as high as that obtained with potentiometer equipment it is adequate for most industrial applications.

The recorder has been designed to give long trouble-free service and the mechanism has been kept as simple as

possible. Gearing and moving mechanical parts have been cut down to a minimum and the simple electronic chassis itself is an interchangeable plug-in unit. The motor which drives the pen has ample power in reserve for operating alarm or control mechanisms and for driving the large central indicating pointer, both of which facilities can be provided at a small extra cost.

METERING PUMP

Said to be suitable for any food production process where controlled transfer of any liquid—whether its viscosity is high or low—is required, the new Q.P. Shirley metering pump has been adapted for general fluid handling from its original purpose of feeding a variable controlled quantity of starch to textile machines. Its inherently constant delivery per stroke—irrespective of wide variations in speed, viscosity, temperature or head—enables quantitative control of flow to be arranged either by absolute setting from a constant speed source, to give controlled output in, say, gal. per min., or by setting in relation to the velocity of some other part of the same plant which may itself be variable in speed. In this latter case, the control of the pump output in relation to the starting, stopping or speed variation of the process is entirely automatic and accurate.

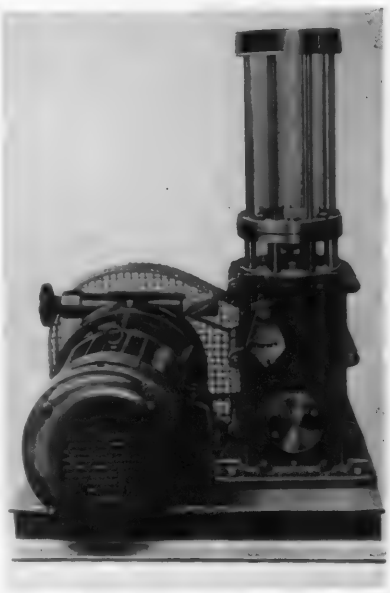
The QP-Shirley Metering Pump is manufactured under licence from Shirley Developments Ltd., by Ormerod Engineers Ltd.

SONIC MIXER

A new wave pulse generator, suitable for the mixing, emulsification, impregnation, separation, etc., of foodstuffs, dairy products, wines and spirits and for many other applications, has been produced by D. F. Developments Ltd., who specialise in mechanical vibrating equipment. The new generator is the direct result of over four years of research into wave and sonic energy transmission through liquids.

Known as the *Sonomec* energy generator, the new machine is primarily intended for use in laboratories where the highest standards are demanded, but it also has obvious uses in other sections of industrial and scientific research. It is a mechanical vibrator with great variability within the frequency range of 0 to 200 cycles per sec. It consists essentially of a mechanically driven disc diaphragm which transmits vibrations to either liquids or solids placed in the 1-gal. capacity processing pot.

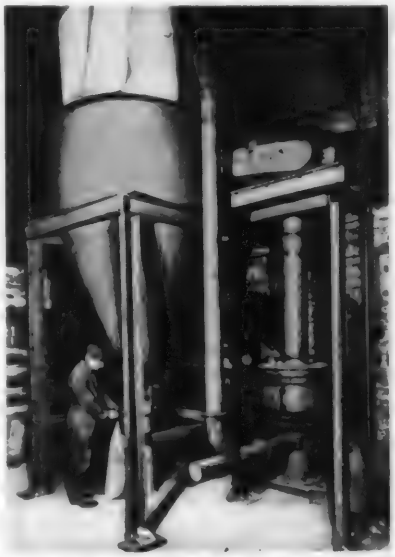
The linkage mechanism, driven by the 2 h.p. electric motor, incorporates a means of adjusting the amplitude of vibration in an infinitely variable manner. Frequency can also be varied without stopping the machine.



New sonic wave pulse generator.

Large capacity wave pulse generators can be designed and supplied for carrying out processes on a commercial scale.

In this connection, the *Sonomec* provides a further advantage: it enables accurate experiments to be made beforehand so as to determine optimum frequency and amplitude of vibration. Thus, a considerable saving can be effected in the capital cost of a large-scale machine, because equipment for varying the vibration frequency and amplitude need not be incorporated and the generator need only be constructed to provide exactly those conditions required for the particular process.



"Superkek" mill for producing fine powders.

GRINDING MILL

An adaptation of their well-known *Kek* pin disc type pulveriser has been developed by Kek Ltd., for the purpose of producing fine powders substantially free from admixture with larger particles.

Known as the *Superkek*, the new machine incorporates a form of air-separation, but unlike many other similar machines, it uses no moving parts to achieve the necessary particle size classification.

In the new mill fan blades fitted to the underside of a rotary grinding disc set up an air flow which carries the ground material to the top of the machine casing. Here it is deflected downwards so that the heavier particles pass back into the hopper while the fine material which remains airborne passes up an outlet pipe. The material to be ground enters the feed hopper—which is contained inside the machine—by means of a pipe.

The superfine powder leaving the selector chamber is drawn into a cyclone collector and the exhaust air is then vented to atmosphere through a multi-bag filter. Alternatively a closed circuit grinding system may be used in which case exhaust air is reintroduced into the mill.

The advantages of the *Superkek* when compared to machines performing a similar duty are said to be smaller initial cost, low operating expenses and normal maintenance which can be carried out with unskilled labour.

FLOUR BIN AID

When solids in powder form are kept in bins with a bottom discharge, as sand bins, flour bins in bakeries, etc., almost always difficulties arise during discharging owing to the tendency of the material to form arches over the discharge opening.

The AB Wasa Spisbrödfabrik, Filipstad, Sweden, has developed a device that has proved very effective for flour and could be used also for other, heavier materials such as moulding sand, etc.

When the flour gets stuck in the bin, compressed air under a pressure of 100 p.s.i. is blown through valves in the walls of the bin in those places where experience has shown that arches usually form. The entrance of the compressed air makes the flour flow and reduces its friction against the wall so that the arched mass of material collapses.

Special valves for blowing the air in through the walls of the bin have been designed. The valve comprises essentially a metal disc sufficiently porous to let the air through, but at the same time able to keep the flour from flowing out. The compressed air is supplied to the valves through hoses that are attached to nozzles in a central compressor.

News Digest

Storm in an egg cup

"Keep your hands off the trade in fresh, unstamped eggs!" the National Farmers' Union has been warned, in an open letter from Mr. E. M. H. Lloyd, chairman of the Society of Objectors to Compulsory Egg Marketing, to Sir James Turner and other promoters of the British Egg Marketing Scheme. The S.O.C.E.M. (pronounced "Sock'em") has registered a strong protest to the scheme, which is being promoted by the three Farmers' Unions of the United Kingdom, and has asked for its abandonment or withdrawal in its present form.

They say that the scheme, which proposes to set up an Egg Marketing Board as the sole buyer and first-hand seller of eggs passing through packing stations, means that a board will be set up with almost unlimited powers to tell producers how they are to carry on their business and is an infringement of the right of housewives to buy unstamped eggs. The S.O.C.E.M. intend to do their utmost "to ensure that the scheme never comes into force."

The N.F.U. say that they remain convinced that the scheme is a necessary and practical business undertaking which should be adopted for the safeguarding of the egg industry in the future, and to provide the consumer with regular supplies of high quality eggs.

Borough Polytechnic to be a college of technology

Senior work in both bakery and sugar confectionery are to be developed at the Borough Polytechnic. This is part of the programme designed to develop the Borough as a college of technology as envisaged in the white paper on technical education. This gives the Government plans for the development of technical education and lists 24 colleges receiving 75% grants which the Government wishes to develop into colleges of advanced technology.

The Polytechnic is one of the colleges listed. It has been identified with bakery education for 60 years and is the only college in the U.K. recognised for the Higher National Diploma in Bakery. It is also the only one in the U.K. offering full-time courses in chocolate and sugar confectionery.

Dr. D. H. Ingall, who has been principal of the Borough for the past 23 years, is to retire in August, having brought the Polytechnic to its present stage of development. During the whole of this period he has been a co-opted member of the Education Committee of the National Association of Master Bakers—and in fact, prior to the establishment of the National Board, was the only principal acting in an advisory capacity in relation to Bakery Education. His predecessors have all been connected with Bakery work since the establishment of the National Bakery School at the beginning of the century.

The 10d. Loaf Budget

Complete removal of the bread subsidy and the extension of wine duty to cider and perry of 15 deg. proof or more were two features of Mr. Harold MacMillan's first Budget last month. Said Mr. MacMillan of his proposal to remove the bread subsidy, "This will produce a saving of about £12 million this year and about £23,500,000 in a full year."

Bakers estimate that the end of the bread subsidy—which should take effect at the end of September—will increase the price of the standard 1¾ lb. loaf by 1½d. Commenting that bakers would welcome the move on the grounds that the subsidy scheme operates unfairly against them, an official of the National Association of Master Bakers said that from the end of the subsidy bakers would probably sell the tenpenny loaf.

In 1941 the 2 lb. loaf cost 4d.; in 1942, 4½d.; in 1945 its weight was reduced to 1¾ lb. and the price was unchanged; in 1949 it went to 5½d.; in 1951 to 6d.; in 1952 to 7½d.; and in February to 8½d.

Industry's gift to science

Ninety industrial engineering companies have now subscribed £2,900,000 to the Industrial Fund for the Advancement of Scientific Education in Schools, which was formed last November to provide capital grants toward the building, expansion, modernising and equipping of science laboratories.

The committee administering the fund has announced that about £600,000 is still required from industry and a further appeal is being made. The first grants, totalling £85,000, have been made to three independent schools and one direct-grant school. The committee has published a brochure on current good practice for the building and equipping of school science laboratories.

Standards Dept. changes title

The Standards Department of the Board of Trade has reverted to its former title of "Standard Weights and Measures Department."

The department is responsible for the central administration of the Weights and Measures Acts and Regulations; and the B.O.T. consider the change of title desirable to prevent confusion between the functions of the department and those of the British Standards Institution, which is concerned with the general standardisation of industrial products.

Horticultural container problems

An exhibition and conference to illustrate and discuss the problems of containers used in horticultural marketing will be held in June. The conference will take place from June 5-8 at 10, Carlton House Terrace, London, S.W.1, and the exhibition on June 6 and 7 at the Royal Horticultural Society's old exhibition hall at Vincent Square, London, S.W.1. Both projects will be organised by the Ministry of Agriculture, Fisheries and Food with the co-operation of national organisations and the European Productivity Agency.

B.F.M.I.R.A. research on beetroot and agar

The jellying behaviour of agar and investigations into pickled red beetroot are described in two reports issued by the British Food Manufacturing Industries Research Association.

The report on agar deals particularly with a Danish sample, comparing it with "true" agars, *i.e.* Japanese agars and those resembling them chemically and physically. The Danish product gave rather weaker jellies than most of the true agars, though of a similar kind. The melting point, however, was much lower than for corresponding jellies and did not reach a maximum.

Pickle manufacturers are likely to be particularly interested in the report on beetroot which describes investigations into the formation of a white deposit and the loss of colour. Preparation, cooking and peeling processes are discussed with special reference to the avoidance of subsequent defects. Recipes are put forward for the composition of packing liquors to be used for pasteurised and non-pasteurised packs and a pasteurisation procedure is recommended.

Smedley's new lines

Frozen pastry, canned oranges, canned steak and kidney pie and canned hearts and sticks of celery are some of the foods being newly marketed by Smedley's Ltd.

Most of the company's range of food products were on show at the recent Scotland's Food Exhibition, including cans of Valencia oranges. These are peeled, divided into segments and sold in 5 oz. cans at 11½d. each. They are said to be the first oranges to be canned in Britain.

Smedley's first frozen pastry line comprises *vol-au-vent* (puff pastry) cases. There are six pastry strips to a 1s. "handy" pack. The centre of each strip is partially cut so that the "lid" rises on being baked. This can be easily removed to insert the filling.

Smedley's claim that the tedium of preparing puff pastry for *vol-au-vents* is reduced to 10 min. at the most for baking, plus a few seconds for lifting the lids and inserting the fillings.

Food on television

"Brand-awareness" is being used to measure the effect of television advertising. A certain class of product is mentioned to groups of people and they are asked what name comes first to their mind, the theory being that people who name a product first in its field tend, other things being equal, to ask for that product in their local shop. T.V. Research (Gallup Poll) Ltd.—an independent organisation—found that *Sunfresh* orange drink was eighth down the list in the section on fruit squashes before TV advertising, but that after 3 months of advertisements they had displaced 5 competitors (only one of whom was using commercial TV) and had climbed to third place. In September last year 3% of those asked in homes receiving ITV programmes named *Sunfresh* first among fruit squashes and 3 months later 14% named *Sunfresh*. The figures for non-ITV homes were 4% last September and 5% after 3 months.

Only 1% named *Summer County* margarine as first in its class before TV advertising. In less than 6 months the product has risen from last to second place in the margarine class and has displaced 5 competitors.

Max prepared cake mixes were in the same position—named by 1% as the first cake mix they could think of. After advertising with ITV the figure rose to 9%.

Cookeen was named first in the cooking fats field by 26% of people asked in September and was at the head of this class. It is still at the head of the class and was named first by 31% of those asked after advertising on ITV. In homes without ITV the figures dropped from 24% to 20%.

OBITER DICTA

● Almost every day we have to wipe ice cream off our window.—*General manager of Mappin and Webb in Oxford Street, London.*

● Fred Greco of Chicago, Ill., inventor of a musical eating utensil, has been awarded U.S. Patent No. 2,722,153.—*D. & O. News.*

● We often serve champagne for breakfast on Atlantic flights but American passengers prefer to call it "fruit juice."—*M. Marcel Chemery, chief chef for Air France.*

● In West Germany U.S. Army Private F. Asztolos drew a $50 fine and a 30-day suspended sentence for "wilfully disobeying the orders of his mess sergeant to cease serving the troops such large portions of potatoes."—*Time.*

● I do not wish to be told that this is the way they do things on the Continent. They eat frogs' legs and have revolutions on the Continent. I trust nobody would suggest that we emulate them in these respects.—*Letter to Manchester Guardian.*

● A chap complained about his underdone beef and asked for a different cut. The waiter went round the corner, turned the beef upside down and said "Is this better, sir?" and the man said, "Excellent!"—*Charlie Cairoli. "World's Greatest Clown."*

● We are bakers and proud of it. With bakers, courtship never ceases. We woo the ladies in baking, in packaging, in merchandising, in selling our products. That is a wonderful thing—maybe that is why we like our business so well.—*Chairman, American Bakers' Association.*

● At the recent meeting of a distillers the chairman drew attention to the fact that there was a phenomenal increase in the consumption of vodka in the U.S.A. This shows that we are losing the cold war, even in America and it is a major diplomatic defeat and what are you going to do about it?—*Question in the House to President of the Board of Trade.*

More ice cream for Manchester

A new 6,400 sq. ft. ice cream depot was opened by Wall's last month at Withenshaw, Manchester.

This depot, one of the largest of more than 100 owned by Wall's in various parts of Britain, replaces a smaller depot in Whalley Range, Manchester. It will also serve Salford and the surrounding area.

Six thousand cans of ice cream are maintained at a temperature of −15°F. in the depot's cold store. Distributing the ice cream to shops in the area are 15 vans. Manager is Mr. A. E. Moore.

Vacuum sealed frankfurters

British-made smoked and precooked frankfurters are now being marketed in transparent packs sealed under vacuum and secured by a metal clip. The ½ lb. pack, developed by Excel Co. Ltd., holds eight frankfurters and retails at 2s. 6d.

For hot meals, it is only necessary to re-heat the frankfurters—still in the sealed pack—in water for 10 min. Similarly, as the frankfurters are precooked they are all ready to serve cold with salads, in sandwiches, or as a picnic lunch.

The growth of Heinz

The business of the H. J. Heinz Co. is now six times as large as in 1945, revealed the president of the company, Henry J. Heinz II, at a gathering of over a hundred of London's leading food distributors recently. "For the past ten years our business has doubled itself every four years," he said.

After drawing attention to the fact that 40% of the Heinz business was within the British Commonwealth, Mr. Heinz said that due to technological improvements and cost control "our productivity has increased by an average of 6% per year over the last five years compared with the National average of about 2%."

He also gave retailers and wholesalers some pointers on the future of strained foods for babies and processed foods generally. Something like 8-million dozen cans of strained foods were currently being sold in Britain each year ("that's almost one third the size of the soup business") and, taking the U.S.A. figures as a comparison, "There is a potential market for strained foods in this country of 50-million dozen," Mr. Heinz forecast.

Mr. Heinz continued: "I think the best evidence of our confidence in the future is the fact that we are investing in a single plant, our new food factory at Kitt Green, Lancashire, more money than we have ever put into any one installation in our 86 years' history. Its capacity will be greater than that of our present very extensive plant in Harlesden."

Sharples' expansion

Sharples Centrifuges are building a new head office, a pilot plant and development laboratory and factory on the York Town Trading Estate, Camberley, Surrey. These facilities are intended to handle a rapidly expanding overseas market for Sharples centrifuges and the continually increasing range of machines being developed by the company.

Bottle prices pegged

A meeting has recently taken place at which were represented the producers of the bulk of glass bottles and jars in the U.K. The Glass Manufacturers' Federation announce that the substantial number of glass container manufacturers who were then represented, wish it to be known that it is their intention not to increase prices for a period of at least six months.

Standard for milk coolers

Among the features of a new British standard for in-can milk coolers (B.S. 2700: 1956) is the introduction of a rating test for comparing the cooling times and water consumption of in-can milk coolers for use with chilled or unchilled water. This will provide the user with a reliable yardstick when he is comparing the performance characteristics of several products.

Certain essential features relating to the design of in-can coolers are also specified in the standard which may be obtained from the sales branch of the British Standards Institution, 2, Park Street, London, W.1, at 3s. net.

Bigger bag factory

Henry Jackson (Liverpool) Ltd., the polythene film and bagmakers, have acquired new premises opposite their present Liverpool factory. The space thus available, some 20,000 sq. ft., will make it possible to house further extrusion and bagmaking plants and a production of some 800 tons per year is envisaged.

Founded in 1900, the manufacturing capacity of Henry Jackson Ltd., has been developed almost entirely since 1946. One of the national manufacturers of hand-made paper bags, it was approached some time ago by Imperial Chemical Industries with a view to converting polythene into bags. The company claim to have been the first in the country to make a polythene block bottom bag by paper bag techniques, and was the original promoter of polythene film liner bags for semi-bulk packs of cooking fat. The company decided some time ago to make its own film and thus the whole operation from granule to bag now takes place under one roof.

ERECTIONS AND EXTENSIONS

Plans have been drawn up for the **Kellogg Co. of Gt. Britain, Ltd.**, for the erection of a bulk sugar storage building at their factory in Park Road, Stretford, Lancs.

*

Plans have been prepared for the erection of a £75,000 cold store at Grimsby Fish Docks for the **Ross Group, Ltd.**

*

Foots, Ltd., box manufacturers, plan to erect extensions at their factory at Foots Bridge, North Shields.

*

Alterations and extensions to the bakery in West Road, Stanley, Co. Durham, are contemplated by **Kelly's (Annfield Plain), Ltd.**

*

Walters "Palm" Toffee, Ltd., manufacturing confectioners, intend to erect a tin shop in Westfields Road, London, W.3.

*

Co-operative Wholesale Society, Ltd., have had plans drawn up for the erection of an aerated water distribution depot on a site off Raikes Lane Industrial Estate, Bolton, Lancs.

*

Edward Sharp, Ltd., manufacturers, Kreemy Works, Maidstone, Kent, are to construct a multi-storey building in St. Peter Street, as an extension to the factory.

*

Alexander King, confectionery manufacturers, King Street, Wishaw, Lanarkshire, are to carry out an extension to their factory at a cost of £10,000.

*

Tate and Lyle, Ltd., are having a £1 million sugar silo erected in Regent Road, Liverpool. The silo will be 90 ft. high and 543 ft. long.

*

W. H. Smart, Ltd., bacon curers, have had outline plans prepared for the erection of a new factory on a 5-acre site at Arthur Street, Redditch, Worcestershire.

*

The Manor Vinegar Brewery Co., Ltd., are having plans prepared for the erection of a vinegar brewery at Chase Road, Burtonwood, Staffs.

**

United Co-operative Baking Society, Ltd., are planning new extensions to their bakery in McNeil Street, Glasgow, C.5.

*

Alfred Hostler, Ltd., manufacturing confectioners, plan to extend their factory at 367, Commercial Road, Portsmouth, Hants.

*

Glaxo Laboratories, Ltd., infants' food manufacturers, have had plans approved for the erection of a cooling tower at their premises in Cobden Street, Montrose, Angus.

*

Standard Bakery Co., Ltd., cake and pastry makers, have had plans prepared for the construction of a single-storey bakery on a site in Lovegrove Street, London, S.W.1.

Anti-mildew paint

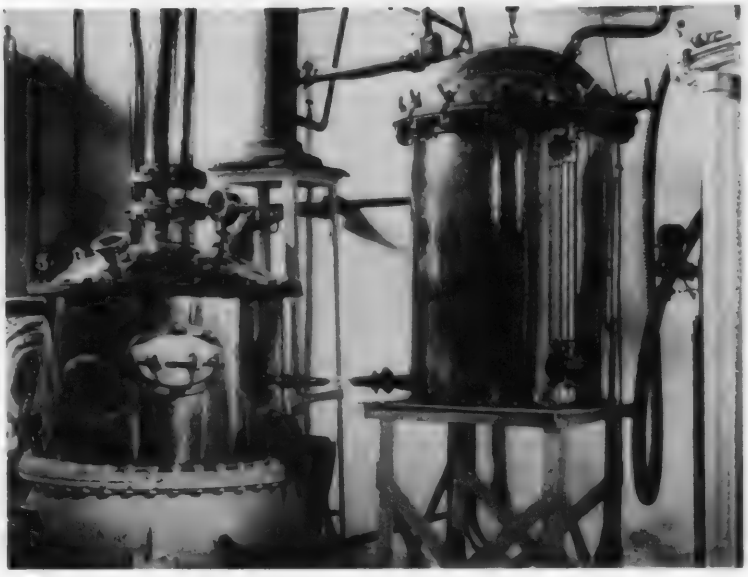
A paint claimed to be capable of resisting the growth of mildew, mould and fungus, has been developed by Factron Products Ltd.

The company say that the paint may be used internally and externally. It is easy to apply and dries with an attractive eggshell finish. This coating is available in a range of twelve standard colours.

Although suitable for all types of building structures, the paint will be of particular interest for breweries, dairies, bakeries, fermentation cellars, etc.

Vitamin-rich wine

Stabilised vitamins are contained in their newly introduced invalid tonic wine according to W. and A. Gilbey Ltd. The wine contains 0·36 mg. of riboflavin and 3·75 mg. of niacin per fl. oz. The first of these is an important growth-promoting factor; the latter has valuable protective properties, it is claimed. Minerals and salts such as calcium, iron and phosphates are also present. Each vat of this wine is certified by a public analyst as containing the specified quantities of these vitamins.



These stills from the film show the picking of the vanilla beans in Madagascar and one of the distillation processes in the London factory.

The Story of Vanilla

A short film with this title has been prepared by Rayner and Co. Ltd., the London essence distillers. It gives a factual and absorbing description of the manufacture of vanilla from the bean to the bottle. The opening scenes show the cultivation of Vanilla Planifolia, a species of climbing orchid, in Madagascar, the fourth largest island in the world. The beans are seen developing from the flower, being picked, and then carefully ripened in the sun. The film then moves to Rayner's factory in London. A series of close-up shots shows the various stages in the process which converts the beans into essence—maceration, distillation, filtration and bottling. The process is shown taking place over a minimum of twelve months from the harvesting of the bean to the packing of the matured Essence of Vanilla. The appeal of the film is enhanced by the deliberate exclusion of obtrusive advertising matter.

Chipolata campaign planned

The "greatest ever" chipolata sausage campaign is being planned by the Oppenheimer Casing Co. to commence in the late spring. It will include a series of full colour posters with space left for the individual shop or factory to overprint their names and slogan.

Change of Address

The Association of Fish Meal Manufacturers has moved to 3-4, Staple Inn, Holborn, London, W.C.1. Telephone: Chancery 6017/8/9. Telegraphic Address: Transcript, Holb., London.

R.S.H. has record membership

A record membership of 14,000 makes the Royal Society of Health the largest health society of its kind in the world. Its annual report reveals that during 1955 the Society achieved the greatest growth in membership since its foundation over 75 years ago. During the last year some 3,600 new members were enrolled, equal to that attained in the first 25 years of the society's existence.

During the year great use was made of the society's information service which answered questions on over 200 topics, such as flies in refrigerators, beetle traps in South Africa, acid-resisting waste pipes, cider making, egg wastes disposal, plastic milk bottles and inhalation of sawdust.

Long service awards

The presentation of nine engraved gold watches in appreciation of long service (35 years to 23 years) was a feature of the British Fondants Ltd. annual party recently attended by 175 members of the staff with wives or husbands. The company now have on their staff 13 employees who have received these awards.

A.E.I. Lamp and Lighting Co. Ltd.

A new company, the A.E.I. Lamp and Lighting Company Ltd., has come into operation to market the lamp and lighting products of The British Thomson-Houston Co. Ltd., Edison Swan Electric Co. Ltd., and Metropolitan-Vickers Electrical Co. Ltd. The brand names *Mazda*, *Ediswan* and *Metrovick*, associated with the lamp and lighting products of the three companies, are being retained.

By amalgamating the distributive resources of the three companies it is hoped to provide a speedier and more comprehensive service to customers.

The chairman of the new company is Mr. E. H. Ball, managing director of B.T.H. Ltd. and a director of Associated Electrical Industries. The joint managing directors are Mr. V. C. H. Creer and Mr. S. R. Eade, both of B.T.H.

Wholesalers move

The National Federation of Wholesale Grocers has moved into new offices at 1, Howard Street, London, W.C.2, a few hundred yards from Ronson House, in the Strand, which has been the Federation's headquarters for some years. The telephone number (TEMple Bar 7841) remains unchanged.

"Pulmac" under new management

Follsain-Wycliffe Foundries Ltd., Lutterworth, nr. Rugby announce that they have taken over from International Pulverisers Ltd., the rights of manufacturing and selling the *Pulmac* range of mills, part of which they have been manufacturing for some years on their behalf.

Company Profits and Prospects

More profits from margarine

Van den Berghs and Jurgens, margarine manufacturers, are raising their Ordinary dividend for 1955 from 15% to 17½%. Net profits have risen from £1,209,299 to £1,599,964 after tax.

Standard Canners' loss

A loss of £77,484 for 1955 was reported by Standard Canners Ltd. An Ordinary dividend of 5% is to be paid against the last payment of 10% for the year to June 30, 1952.

Smaller chocolate profits

Jamesons Chocolates, Ltd., made public in May last year, are paying a final Ordinary dividend of 7½% for 1955. The group trading profit of £186,594 compares with £251,916 in the previous year and the net profit of £88,449 with £129,820 after taxation.

Spratts' good year

Turnover in all the branded products of Spratt's Patent Ltd. has been well maintained during the year, reported the chairman at the annual meeting, and the net income of the Group before taxation has increased from £310,989 to £407,610. The parent company's net income for the year has improved to £75,558 against £49,763. The company's new canned cat food is still in the development stage and has not yet been really established. Plans are in hand to improve the factory and warehouse arrangements for the company's biscuit food and canned meat trade.

Tizer expansion

Last summer, which was particularly favourable to the soft drinks industry, enabled Tizer Ltd. to make a consolidated trading profit of £270,209, reported the chairman, Mr. Fred Pickup, at the company's annual meeting.

Continuing its policy of advancement, the company acquired a further subsidiary Our Boys Mineral Water Co. Ltd., operating in South Wales, during the year.

A final dividend of 15% making 20% for the year was paid.

Industrial sugar prospects

"The more we can mechanise the better," said the chairman of Manbré and Garton recently at the company's annual meeting. The company, who are sugar refiners and manufacturers of brewing sugars, glucose, syrups, cattle foods, etc., are increasing their productive capacity for sugar and glucose and their object is not only to provide for increased and more efficient production but also to save manpower and labour costs, being conscious of the difficulty of replacing old reliable employees.

The fine summer, which favoured the brewing and soft drinks trades reflected on the company as suppliers to these trades and the net profit increased from £779,235 to £818,332. A final Ordinary dividend of 22½% making a total of 30% for the year was paid.

New, non-food uses of sugar were outlined by the chairman, particularly in the manufacture of plastics and detergents. He predicted that in a few years, instead of a world surplus, it would not be easy to satisfy demands for sugar.

New Cow and Gate biscuit

A new Cow and Gate biscuit is to be made and marketed by Huntley and Palmers Ltd., under arrangements between that company and Cow and Gate Ltd., it was announced at the company's annual meeting by Mr. W. R. B. St. John Gates, chairman.

The base of the Cow and Gate business in Britain has been broadened, he added, by the purchase of Trufood, until recently a subsidiary in the Unilever group. The business will continue to operate as a separate entity.

Group trading profits rose from £1,688,608 to £1,913,996 and the net profit from £953,618 to £1,084,337 subject to tax. The annual dividend rose from 15% to 17½%.

Booklets Received

★The manufacture of monosodium glutamate is discussed by D. Hodson, chief engineer of Fredk. Boehm Ltd., in "Wiggin Nickel Alloys" No. 36. The article describes the advantages of using *Corronel B* thermometer pockets when very accurate temperature control is required.

★Specifications and specimen layouts of their *Airhydropump* air-operated hydraulic pumps, valves and other accessories are described by Charles S. Madan and Co. Ltd. in their new catalogue.

★The floor maintenance division of Matling Ltd., describe their complete range of floor cleaning machines for wet scrubbing, dry scrubbing, polishing and drying in a new leaflet. They include a long-handled air-powered polisher and scrubber suitable for vat cleaning, etc.

★A pictorial record of the manufacture of their products is presented in a new colour booklet "The Wall's Way" by T. Wall and Sons. Ltd.

Appointments and Retirements

MR. F. W. BURTON has been appointed secretary to the Association of Fish Meal Manufacturers.

MR. H. PERCY MAYBURY, O.B.E., who has been actively connected with The British Arkady Company Ltd. for nearly 30 years, has now retired. During the last 11 years Mr. Maybury was managing director and ultimately chairman. He will be succeeded as managing director by MR. C. K. CURTIS.

THE HON. J. K. WEIR has relinquished his position as joint managing director of G. and J. Weir, Ltd., to enable him to devote his whole time as chairman of the Weir group of companies.

MR. J. RUSSELL LANG has been appointed sole managing director of G. and J. Weir, Ltd., and SIR CHARLES CONNELL, chairman of Charles Connell and Co. Ltd., has been appointed an additional director of G. and J. Weir.

MR. P. FIRMSTON-WILLIAMS, sales director of J. and J. Beaulah Ltd., of Boston, has been appointed to the board of United Canners Ltd. He will be responsible for the sales direction of both companies, but the production units and the sales forces of the two companies will remain independent.

Mr. Firmston-Williams joined the tea department of J. Lyons and Co. Ltd. after the war and graduated from van salesman to a district manager. He was subsequently appointed assistant sales manager of the frozen food department and in 1952 he spent some three months in New York introducing Lyons *Frood* to the Americans. Since he joined J. and J. Beaulah he has made great progress as sales manager and, later, as sales director.

In addition to controlling the sales of *Beaulah* brand canned fruit and vegetables, he will now be responsible for the distribution of *Benedict* and *Country Market* brands of canned foods.

Obituary

MR. S. A. SCREETON died on March 28. He was chairman of Farrow and Jackson and Purdy Ltd., for 24 years until his retirement in May 1954.

MR. R. J. GARDNER, late of Stevenson and Howell Ltd., died on March 13, at Worthing, Sussex, where he had resided since his retirement in July, 1952. Mr. Gardner represented the company for many years in Ireland and the Birmingham area with conspicuous success.

Food News Overseas

Milk powder for Honduras

A small plant for reconstituting, pasteurising, and homogenising milk powder has been established in Tegucigalpa, Republic of Honduras, for the firm of Industria Lechera Delta. The milk powder is being imported from the U.S.A. and the prepared milk is being sold in waxed cartons.

Mexican milk plant for Nestles

Nestles' third plant in Mexico has been established at Coatepec, near Jalapa, Veracruz. The other two plants are located on the other side of the country at Octolan and Lagos de Moreno. Among other products, the company will produce powdered milk.

Uruguayan meat plant

A new Frigorifico, the Compania de Abastecedores del Este S.A., with a capital of Ur. $1 million, has been inaugurated in Uruguay. Situated in the south-eastern corner of the country its main purpose will be to supply fresh meat to neighbouring towns, but it is reported that future plans include the canning of meat for export.

Reports from Uruguay say that agreement has been reached with the Argentine for the loan of 60,000 head of cattle to Uruguay which will be sold to foreign-owned Frigorificos for canning.

In Paraguay, the International Products Corporation are re-opening their cattle processing plant at San Antonio.

Fish technologists' meeting

An International Meeting of Fish Processing Technologists organised by the FAO Interim Committee on Fish Handling and Processing is to take place in Rotterdam from June 25 to 29, at the invitation of the Netherlands Government. Although invitations have been issued officially to the 72 member governments of FAO to send delegates, the meeting will be open to any fishery technologist who wishes to attend.

Dr. G. A. Reay of the Torry Research Station, Aberdeen, will be chairman of the meeting and the chairmen of four committee working groups —Mr. F. Bramsnaes of Denmark, Mr. K. Bakken of Norway, Prof. George Borgström of Sweden and Mr. E. Heen of Norway—will present reports on chilling and freezing of fish, fisheries products for tropical consumption, and prepackaged fisheries products.

One day of the meeting will be devoted to visiting the new Fisheries Research Laboratories, fish pier and fish plants at Ymuiden.

A symposium on the chilling of fish will be held during three days of the meeting. It will deal with the use of antibiotics, bacteriostatic ices and dips, brine cooling, sea water ice, scale and crushed ice, and fresh fish quality assessment, using organoleptic and objective methods.

Fishery technologists who wish to attend the meeting should notify the secretary of the Interim Committee, Dr. Hess, chief, Technology Branch, Fisheries Division, FAO, Rome.

Rhodesian tea developments

It is reported that one of the world's largest tea producing companies is to float a company in Rhodesia. The new company will develop at least 10,000 acres of land in the Inyanga area which could eventually produce 12,000,000 lb. of tea a year. The company has already taken over the Aberfoyle tea estates near Inyanga and will develop large acreages in the Inyangani area.

Biggest fats factory in the Southern Hemisphere

Lever Brothers' new £1,500,000 factory at Boksburg in the Transvaal is claimed to be the largest edible oil and fat factory in the Southern Hemisphere. It has been laid out on a 43-acre site near what is the largest groundnut growing area in South Africa and is also close to the area of largest consumption. Twin seed stores with a capacity of 12,000 tons of shelled groundnuts or 7,000 tons of sunflower seed are situated at the factory, the nuts or seeds being mechanically conveyed from the railway sidings.

Groundnuts are shelled before they reach the factory but sunflower seeds are dehusked on the premises. Extraction is by worm screw drive expellers and by solvent extraction. Oils are filtered and deodorised and go through a hydrogenation process before their final blending. For the domestic market fats are packed in small containers but for the food and baking industries they are sold in bulk quantities. The residue cake or pulp is made into cattle feed. The whole manufacturing process is under constant laboratory check.

International Starch Convention

The International Starch Convention —probably the largest international gathering of starch chemists to be held in Europe, is taking place from May 2-4 at the Cereal Research Station, Detmold, Germany.

About half of the topics to be discussed—which include basic research, starch manufacture and properties and its derivatives—are concerned with the application of starch in food manufacture.

373 million pigs

The U.S. Department of Agriculture has reported that the world pig population increased slightly during 1955 to a "new all-time high" of 373,300,000. This was about 1% greater than the estimate for 1954 of 369,500,000, and 27% higher than pre-war totals.

During 1955 pig numbers increased around 8% in North America and 1% in Europe, all of the increase being in Eastern Europe.

Half-million for cannery

North Queensland pineapple growers, along the 300 miles of coastline from Daintree to Ayr, are moving to have a new streamlined £A500,000 cannery built in the Cairns district.

The present cannery, near Cairns, is regarded as antiquated. The growers are now to approach the Queensland government to fulfil a promise it made last June to guarantee the money, basing their argument on the fact that the industry has now become stabilised and is expanding.

This season 156 growers supplied the cannery with about 1,250 tons of fruit, but daily deliveries were often in excess of the cannery's capacity owing to the short harvest time of six weeks. The limited period of intake increased processing costs because of overtime, but the industry is adopting two new field techniques to spread the length of the harvest.

Costs of cannery processing in the southern part of Queensland are less. Because of the long distance, cans, labels and cartons have to be sent to Cairns in the north. However, the far north of the State is compensated by its growing conditions. Cannery fruit can be produced in from 12 to 15 months compared with 24 to 30 months in the south. The northern canned pineapples have a two-months start on those anywhere else in Australia for the world market.

Food Packaging

Paper flour sacks

A new system for packaging bags of flour into semi-rigid Kraft paper sacks has been perfected by the St. Regis Paper Co. of New York. The sacks have stiff bases which fold over when the sack is empty.

Bags of flour flow down a chute into the paper sacks fixed firmly on the end. Each pack is placed automatically and compressed and it is claimed that by the time the sack is filled it is quite rigid, cannot break and is not affected by humidity.

Near-automation at tube factory

Claimed to be the most modern collapsible tube factory in the world, Venesta's new Silvertown works employs a flow-line system which has increased output from 38 to 55 tubes per min. The former output is achieved by the batch system which is still used for short runs. The production of collapsible tubes in this country is now at the rate of some 360 million a year.

The flow-line system is a big step towards automation. Instead of the various stages of tube manufacture being carried out in different departments, all the operations are carried out in one single line of connected machines. The circular blanks from which tubes are made are fed in at one end and then six operations are carried out in succession: extruding, trimming and screwing, enamelling, printing, capping and final inspection and packing. All the machines are linked by transfer mechanisms which replace human effort. The machines include an automatic capping machine said to be the first really successful one of its kind. It solves the problem of capping tubes to the correct tightness—a necessary precaution if seepage during filling or storage is to be avoided. Venesta make their own metal blanks, called "slugs" if of aluminium and "dumps" if of other metal, in a separate department, adjacent to the large area in which the tubes are made.

A further process—annealing—is required for aluminium tubes. This is because aluminium must be extruded hard and is consequently springy. Annealing produces the flexibility necessary for a collapsible tube.

French package research laboratory

A new package testing and research laboratory costing about £140,000 has been set up in France. It is the only one of its kind in the country. The official opening was attended by Dr. G. L. Riddell, Patra's Director of Research. Its title is Le Laboratoire General Pour Emballages (L.G.E.) and it is at 105, Boulevard Suchet, Paris 16e.

The laboratory, which is in a well-converted building at the Auteuil-Bologne Railway Station, occupies approximately 10,000 sq. ft. It is a replacement for an earlier one of the same name which was operated jointly by the French Railways, the Associations of both solid and corrugated fibreboard case makers and the Gummed Paper Tape Producers Association.

Filling paper sacks with bags of flour.

Nesting toffee tin.

Nesting toffee tin

A corrugated decorative effect given to new 7 lb. toffee tins for Geo. W. Horner Ltd., enables them to be stacked one inside the other. Metal Box Co., who produced them, made the corrugations deeper at the base than at the top, producing a slightly tapered shape, so that the tins can nest inside each other and save storage space. A slot is pierced in the rim of the lid so that it will fit over the edge to make a display panel.

Plastic-coated paper cup

An improved paper cup claimed to resist heat (*e.g.* hot jam), and to be almost impermeable to water vapour and waste has been developed in Germany according to *Die Neue Verpackung*, 1955 **5**, 5,225.

The cup is double-rimmed, and the inside is coated with a plastic compound applied by spraying. By evaporation of the dispersing agent, necessary when applying the spray, a completely continuous, nonporous plastic film is formed. The paper is thus said to be given remarkable properties which make possible new applications. The very elastic film coating gives a durable seal which is free from taste and odour, and resistant to the attacks of alkaline as well as acid foodstuffs. The heat resistance of the plastic film allows the cup to be filled with hot jam without danger. There is no limit to the duration of storage because at a relative humidity of 65% the impregnation reduces the water vapour permeability of the walls of the paper cup to less than 3 g. per $m.^2$ per day, it is claimed.

Cheaper cuts "visibly wrapped"

Tripe and onions, ready for the pot, and a one-portion mixed grill (consisting of steak, kidney, a tomato and sausage), both overwrapped in *Cellophane* cellulose film, are among self-service meat packs recently introduced by Gardner's Food Service, of Sutton, Surrey. Other popular items include pigs' feet, breasts and hearts stuffed and ready for the oven, mince, oxtail portions and sliced kidney—all packaged in *Cellophane*.

By presenting these cheaper cuts of meat and offal, "visibly" packaged and carefully prepared, Gardner's Food Service has successfully introduced the young housewife to nutritious and economical meat dishes and helped to overcome her prejudices. In addition convenient multiple packs, such as tripe and onions and mixed grills, made ready-sellers of items which might sell slowly when offered by themselves.

The company uses *Cellophane* type MSADT 300, a film specially developed for meat wrapping. The meat is placed on white card or fibre trays and then overwrapped and heat-sealed. Labels clearly indicate the weight, price and —most important of all for repeat orders—the cut and origin of the meat.

Tripe and onions, mixed grill and oxtail—pre-packed and ready for the pot.

Research on heat-sealed foil

The successful use of hot-sealing aluminium foils for the packaging of soup, cheese portions, etc., demands a knowledge of the temperature required to produce either a strong seal or a weak one (for easy opening) according to *Schweizer Archiv für angewandte Wissenschaft und Technik*. A method for determining this temperature with relative precision is suggested, using heat sealing apparatus and an adhesive strength tester. A commercial type of packing foil (coated with thermoplastic lacquer on one side and a plain protective paint on the other) is cut into strips. Three strips are superimposed so that the thermoplastic coating of the lowermost is on top and that of the two other strips below. The three strips are placed together on the heating bench so that one of their ends exactly coincides with the end of the heating bench having the lowest temperature. Pressure is applied by means of a piece of wood having a 0·39 in. felt layer on the contact surface and a weight corresponding to the pressure applied.

The time should be measured from the moment when the sample is placed on the heating bench.

The cooled sample is cut lengthwise into two strips ½ in. wide, one of them being used to test the adhesive strength of thermo-lacquer on thermo-lacquer and the other to test the adhesion of thermo-lacquer on ordinary lacquer. For that purpose, the three foil strips are carefully separated from each other at the low-temperature end of the sample strip. Depending on the type of union to be tested, the corresponding two of these three ends are inserted into the adhesive strength tester in such a way that one end is clamped down on the spring balance and the other end introduced in the slot of the crankshaft.

By carefully turning the crank the sample is subjected to tensile stress. The latter's value can be read on the scale of the spring balance. The adhesion of the two clamped foil strips lessens as the tension increases until the zone of the welding proper has been reached. Depending on whether the package is to be closed by gluing or welding, the turning operation continues until the tensile strength required of the glue or the welding point has been reached. Then the sample is released and placed on the heating bench or measured by means of a special rule to determine the temperature at which the desired result has been achieved.

Polythene caps for tubes

Following the success achieved with elongated polythene caps for metal collapsible tubes, Flexile Metal Co. Ltd. has laid down a moulding plant and a range of tools for supplying polythene caps for short screwed nozzle tubes. No. 80 caps are now available and they will shortly be followed by No. 95 caps. Both these sizes will be available either in the standard octagon style or in the round milled shape.

Polythene caps, which are widely used in the U.S.A. and on the Continent, are said to have many advantages over ordinary hard moulded caps. Owing to the soft nature of the material no wad is required; the interior of the cap is fitted with a dome which forms a perfect seal against the orifice of the tube. Not only does a polythene cap give a better seal than a hard plastic cap with a wad, but there is no danger of the wad falling out or adhering to the end of the tube and in addition, owing to the absence of a wad, there is a considerable price advantage. Polythene caps are less likely to work loose during transport than hard plastic caps and are particularly suitable where there is any danger of seepage, as in the case of thin materials or products which are to be exported to the tropics. Polythene caps have a glossy finish and an attractive appearance and can be supplied in black, white natural or a range of pastel shades. They are equally suitable for use on aluminium, tin-coated lead or tin tubes and owing to the chemical stability of the material they are suitable for use with nearly any type of product.

Standard caps will be available at very attractive prices and without tool charge. Flexile Metal Co. is always prepared to design and produce special caps for a customer's exclusive use, but in most cases it would be necessary to make a tool charge.

Sample tubes fitted with polythene caps are available for assessment on application to Flexile Metal Co. Ltd.

Cotton tape dispenser

A portable hand dispenser, constructed to the contour of a tape coil, has been added to their range of *Rippatape* (self-adhesive cotton tape) dispensers by P. P. Payne and Sons Ltd. This dispenser permits a good, firm grip, allowing the use of baling tension as the tape is applied direct to the package or container. A built-in cutting blade is operated by a simple trigger action.

The new dispenser is said to handle any width of *Rippatape* from ¼ in. to 1 in. in 50 yard coils on 3 in. centres. The cutting blade is cheaply and simply replaceable. Dispensers are available for left and right hand use at 30s. each.

New Companies

Universal Mineral Water Co., Ltd. (560920.) 78-80, Cornhill, London, E.C.3. £100. Subs.: M. B. Boreham and F. E. Poulter.

G.B. Confections, Ltd. (560427.) County Chambers, Weston Road, Southend-on-Sea. Mfrs. of and dealers in chocolate, sweets, confectioneries, etc. £100. Dirs.: M. and K. L. Gershlick.

Dovorian, Ltd. (560589.) Sweet Factory, Green Lane, Temple Ewell, nr. Dover, Kent. To take over business of a wholesale confectioner and confectionery manufacturer formerly carried on by W. G. Wilkins. £1,000. Dirs.: C. H. Fayers and F. E. Dixon.

House of Seagram, Ltd. (560661.) 45, Park Lane, London, W.1. Distillers, brewers, maltsters, manufacturers of and dealers in whiskey, rum, wine, beer, gin, aerated waters, etc. £50,000. Dirs.: J. Chiene, A. Stirling, G. B. Palau and H. D. S. Ison.

Balch Flavor Co., Ltd. (560670.) 210-212, York Way, Kings Cross, London, N.7. Mfrs. of and dealers in raw materials used in the preparation of sauces, powders and similar compounds required by ice cream manufacturers, etc. £200. Dirs.: G. G. Balch and N. E. Giusti.

"Fairy" Food Products Co., Ltd. 21, Manor Drive, Didsbury, Manchester. £1,000. Dirs.: A. E. and Karoline Rose.

Frozen Fresh (Fillets), Ltd. (561050. 17, New Square, Lincoln's Inn, London, W.C.2. Importers and exporters of and dealers in fish. £10,000. Dirs.: H. Wright, R. S. Deans and J. Gunnarson.

North West Egg Producers Packing Station, Ltd. Pilling, Preston, Lancs. £8,000. Dirs.: R. M. Critchley and J. R. I'Anson.

Instant Sales, Ltd. (561305.) 189, Regent Street, London, W.1. To carry on business of purchasing, manufacturing, hiring, selling, maintaining and servicing vending machines and foods. £100. G. and Maureen L. Davies.

Ambassador Food Co. (London), Ltd. (560177.) 40-42, Oxford Street, London, W.1. Growers, importers, exporters, canners, bottlers, processors of and dealers in frozen and other foodstuffs. £50,000. Subs.: A. H. Fisher and G. R. Evans.

Nutgrove, Ltd. (560155.) 8, Edward Street, Blackpool. Mfrs. of and dealers in confectionery, chocolates, sweets, ices, cooked and prepared foods. £2,000. Subs.: C. Satterthwaite and Mrs. P. Murdoch.

Grundon Waste Food Products, Ltd. (560190.) 22, High Street, Hounslow, Middlesex. Mfrs. of and dealers in animal foods, fodder, cattle food, etc. £1,000. Dirs.: L. J. and Mrs. B. L. Grundon.

Holt's Bakery, Ltd. (560208.) Sherwood House, Lake Lane, Barnham, Sussex. £1,000. Dirs.: S. A., R., Mrs. E. A. and Mrs. G. Holt.

Cerea, Ltd. (560302.) Red Lion Yard, Market Place, Wells, Somerset. Millers, factors of and distributors of flour. £100. Dirs.: D. and Jacqueline Randal.

Delifare, Ltd. (561895.) Lambton House, Lambton Street, West Hartlepool, Co. Durham. Mfrs. of and dealers in materials and products for the food trades and from which foodstuffs and beverages can be manufactured. £2,500. Dirs.: J. N. and Mrs. M. I. J. Wiley, F. E. Pearson.

The Leonard Hill Technical Group this mouth

Dairy Engineering.—Continuous Buttermaking Processes; Glass—Reinforced Plastic Cowls for Electric Delivery Vehicles; The "Jones" Bulk Starter System; Handling Crated Milk with a Power Tug; Milk Sterilisation Plant for the North Staffordshire Co-operative Dairy; The Early Days of Railway Milk Transport, 1.

Manufacturing Chemist.—Glycyrrhetinic Acid; Steroid Hormones in Body Processes; U.S. National Bureau of Standards Radiochemical Laboratory; Monsanto Chemical's new Laboratory; Progress Reports; Pest Control Chemicals, Therapeutics; Essential Oils in India.

Chemical and Process Engineering.—Coal as a Raw Material for Industry; The Movement of Materials in Industry; Mixing; Ion Exchange in Uranium Production; Materials and Techniques for Chemical Plant Construction.

World Crops.—Agricultural Developments in Fiji; Small-scale Farming in the West Indies; Mexican Agricultural Prosperity; Pacific Subsistence Crops—Sago.

Paint Manufacture.—Recent Developments in Epoxy Coatings; Anti-fouling Paints Today; Maleic Modified Drying Oils; Instruments for the Paint Industry; Progress in Instrumentation in Paint Factories.

Corrosion Technology.—Corrosion Research Laboratories, 10; British Insulated Callender's Cables; Lanolin as a Temporary Protective; Salt-Glazed Vitreous Clay Pipes; Corrosion Problems on the Texas Gulf Coast, 2.

Fibres.—Radioactive Isotopes and their Use in the Textile Industry; The Roselle Family; Triacetate Fibres—A Survey.

Snak Pak Food Products, Ltd. (560386.) 6, Penylan Road, Cardiff. To take over business of sellers of foodstuffs, nut, cheese and biscuit packers carried on as "Snak Pak Food Products." £20,000. Dirs.: V. L. and Mrs. M. Morgan, F. H., K. and C. W. Morgan.

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From Jordan and Sons, Limited, Company Registration Agents, 116, Chancery Lane, London, W.C.2.

Trade Marks

APPLICATIONS

CHEESECUIT.—734,025. Cheese flavoured biscuits for human consumption. **Rose Taylor,** 6, Lyndhurst Square, London, S.E.15.

NOR-PAK.—739,373. Rice, tapioca, sago, barley (prepared for food for human consumption) and oatmeal. **Northern Merchants, Ltd.,** 26, Elbe Street, Leith, Edinburgh, 6.

SOUTHDOWN.—B743,579. Non-medicated confectionery. **J. Tolhurst, Ltd.,** 120, Downland Avenue, Southwick, Brighton, Sussex.

PARAMOUNT.—B744,604. Tea. **Paramount Tea, Ltd.,** 5, Philpot Lane, London, E.C.3.

PURITY PAT.—745,821. Meat pies and sausage rolls. **Belfast Food Products, Ltd.,** Purity Brand Food Factory, Prince Regent Road, Castlereagh, Belfast, N. Ireland.

OGO POGO.—746,065. Non-medicated confectionery. **Barratt and Co., Ltd.,** Mayes Road, Wood Green, London, N.22.

SPICEMANNS.—739,437. Caraway seeds for food. **Spicemann's, Ltd.,** Pepper Mills, Kelvin Avenue, Hillington, Glasgow, S.W.2.

CORCHERO.—B743,913. Fresh fruits and vegetables, seeds and foodstuffs for animals. **Felipe Corchero,** Jimenez, Montijo, Badajoz, Spain, c/o Heron Rogers and Co., 181, Queen Victoria Street, London, E.C.4.

MILCOLATE.—744,790. Chocolate flavoured syrups for making beverages. **Ryder and Co.,** St. Andrew's Works, Bradford.

HIS EXCELLENCY.—745,818. Scotch whisky for export. **Bartels, Rawlings and Co.,** 34, Borough High Street, London, S.E.1.

GEISHA.—B613,446. Canned fruits, vegetables and fish. **Nozaki and Co., Ltd.,** Hakkai Building, No. 6, Tori-I Chome Nihonbashi, Chuo-ku, Tokyo, c/o W. P. Thompson and Co., 12, Church Street, Liverpool, 1.

FRIKKIE FISH STICK.—742,897. Fish and shellfish (none being live), whale meat and edible substances for human use made from marine organisms. **Union Smokeries (Pty.), Ltd.,** East Quay, Docks, Cape Town, South Africa, c/o Trade Marks Owners Association, Ltd., 50, Charing Cross, London, S.W.1.

ENGLISH LANE.—744,528. Edible oils and fats. **Thomas Hedley and Co., Ltd.,** Newcastle-on-Tyne.

TALISMAN.—745,061. Edible oils and fats, eggs, milk and dairy products for food. **H. D. Hardie and Co. (Edinburgh), Ltd.,** Silvermills, Edinburgh, 3.

CHOCO-TOFFS.—B744,357. Non-medicated confectionery coated with or containing chocolate. **Mayfair Products, Ltd.,** Mayfair Building, Sunderland, Co. Durham.

UNIX.—744,916. Gelatine and preparations of gelatine, all for use as ingredients in food. **John Crampton and Co., Ltd.,** Altrincham Road, Wythenshawe, Manchester.

AT HOME.—745,109. Tea. **R. Demuth, Ltd.,** Bear Lane, Farnham, Surrey.

SWAZICADO.—745,250. Fresh fruits and fresh vegetables. **J. Gebers,** Avolitchi Orchards, Bremersdorp, Swaziland, South Africa, c/o Haseltine, Lake and Co., 28, Southampton Buildings, Chancery Lane, London, W.C.2.

Information and Advice

This Service is available to subscribers to FOOD MANUFACTURE. If a stamped addressed envelope is enclosed replies will be sent by post, but enquiries cannot be answered by telephone.

Pea flour

B.7786. *We would appreciate information regarding the composition of pea flour.* (Dublin)

The following figures for the chemical composition of pea flour, contrasted with those of wheat flour, were published by the German authority, Dr. H. Wastle, in 1926:

Pea flour (%)		*Wheat flour* (%)
11·28	Water	12·63
25·72	Protein	10·68
1·78	Fat	1·13
57·18	Carbohydrates	74·69
2·78	Ash	0·52
356	Calories per 100 g.	360

Table salt

B.7749. *We are grinding lake salt to good effect: the ground salt is fine and uniform and in this respect satisfactory. Our problem is that it will not pour. We would like suggestions for eliminating this caking.* (Adana, Turkey)

According to British Patent No. 407,829 the addition of up to 7% of potassium chloride to granular table salt prevents caking. It has also been suggested that about 3% of calcium phosphate be added.

Canned bread

B.7797. *We have an enquiry from abroad about canned bread in 30 oz. and larger cans, but we know very little about this. Would you be good enough, if you have no recipe for it, to give us some literature references?* (Belfast)

We have not published any articles on this subject since the war, but a good up-to-date survey has been issued in America. This is a brochure called "Invitation to the Baking Industry to Manufactured Canned Baked Products for the Armed Forces Combat Rations" and is issued by the Quartermaster Food and Container Institute for the Armed Forces, 1819, West Pershing Road, Chicago 9, Ill.

This pamphlet gives the following recipe for canned white bread:

Ingredients	*Parts by Weight*
Hard wheat flour, enriched	100·0
Water, not more than	50·0
Compressed yeast or equivalent active dry yeast	2·0
Salt	1·75
Sugar (cane, beet or corn)	8·0
Shortening	12·0
Buttermilk solids	2·0
Edible lactic acid (60%)	0·30
Inactive dry yeast	1·5

The dough is baked in tin cans, rather than in baking pans, with the can lid kept in place loosely, to permit the escape of gases during baking. The cans are sealed immediately (within 60 sec.) after they are removed from the oven, and then cooled rapidly in order to preserve the colour and flavour.

Information supplied

The Enquiry Service has dealt with requests for the names of manufacturers and suppliers of plant, machinery and materials, and also general information as follows:

B.7719. *Suppliers of ultrasonic equipment.* (Belfast)

B.7720. *Manufacturers of flavouring materials.* (Bromborough, Cheshire)

B.7721. *Makers of floor cleaning machinery.* (Inverness)

B.7722. *Information on use of homogenisers for making fruit juices.* (Marsa, Malta)

B.7723. *Information on tomato peeling machine.* (Hamburg, Germany)

B.7724. *Manufacturer of unrefined molasses.* (East Balden, Co. Durham)

B.7725. *Advice on conducting a food tasting panel.* (Glasgow)

B.7726. *Information on yeast.* (Dallas, Texas)

B.7727. *Manufacturers of machine for filling malt extract.* (Nottingham)

B.7728. *Recipe for "deposit powder" for marshmallows.* (Norrköping, Sweden)

B.7730. *Literature on canning fruit and vegetables.* (Spalding, Lincs.)

B.7732. *Makers of monosodium glutamate.* (Darlington).

B.7733. *Literature and books on biscuit production.* (Oslo, Norway)

B.7734. *Information on pineapple juice production.* (Manchester)

B.7735. *Information on candied peel production.* (Dublin)

B.7736. *Recipe for marshmallow.* (Cardiff)

B.7739. *Economical disposal of factory effluents.* (St. Albans)

B.7740. *Suppliers of machinery for conveying fruit.* (Coventry)

B.7741. *Makers of machines for filling sauerkraut into cans.* (Seine-et-Marne)

B.7742. *Suppliers of flour handling equipment.* (Barnstaple)

B.7743. *Publishers of French-English technical dictionary.* (Southampton)

B.7744. *Manufacturers of freezing installation.* (Coldstream, Berwick)

B.7745. *Disposal of factory effluents.* (Brentford)

B.7746. *Manufacturers of suspending agent for orange squash.* (Sheffield)

B.7748. *Names of public analysts specialising in cheese.* (Southampton)

Recent Patents

COMPLETE SPECIFICATIONS ACCEPTED

749,174. B. A. Fuchs. Screw-cap for bottles, tubes or the like.
749,109. Braunschweigische Maschinen-Bauanstalt A.G. Triangular supports for sugar-cane crushes.
749,244. G. N. Deane. Means for producing ice, or for freezing or cooling and for heating beverages or comestibles.
749,182. Rose Bros. (Gainsborough), Ltd. Ice cream packages.
749,413. Air Conditioning and Engineering (N.I.), Ltd., and O. S. Brown. Mixing machines, especially for use in mixing meal.
749,233. F. S., J. M., E. M., A. C. and F. H. Lapeyre and F. E. Riess (trading as Peelers Co.). Shrimp de-veining machines.
749,426. J. Harradine and Sons, Ltd. Colouring of metal-coated articles of confection.
748,753. Food Machinery and Chemical Corporation. Box-wrapping systems.
748,645 and 748,764. Unilever, Ltd. Foodstuffs.
748,617. A. B. Kiposan. Method of treating slaughtered animals.
748,619. K.C.P., Ltd. Manufacture of articles of food and confectionery.
748,843. Glaxo Laboratories, Ltd. Sealing of bottles, jars, vials and like containers.
748,639. Enterprise Manufacturing Co. of Pennsylvania. Apparatus for freezing desserts.
748,814. S.A. Frigorifico Anglo. Recovery of fat from animal fat containing portions.
748,536. J. W. Flower and Co. (Engineers), Ltd. Corking machines for bottles.
748,346. Hunt Partners, Ltd. Construction of paper box or carton.
748,161. Latterie Industriali Riunite Lir Robbio. Cheese product and method of making same.

ABSTRACTS OF BRITISH PATENTS

Heat treating liquids

A method of sterilising an apparatus for the heat treatment of *e.g.* milk, includes the step of removing liquid seals between the chambers by passing steam of suitable temperature and pressure through inter-connected chambers. The automatic valves between the chambers are so adjusted that the velocity of the steam passing through the valve is sufficient for complete expulsion of the liquid forming the seal from the apparatus.—742,197. *Murray Deodorisers, Ltd.*

Lixiviation of solid material

A body of the material (*e.g.* sugar beet cossettes) is established and maintained in closely packed but liquid-pervious condition and in cylindrical form. Fresh material is supplied at one end, and treated material is removed from the other end of the body, while the body is rotated about its axis and conveyed from the supply end to the discharge end. A current of lixiviation liquid is passed under gravity in counter-current to the travel of material at such a level in the body that it flows through a section only of the body.—743,122. *A/S. de Danske Sukkerfabrikker.*

Fish sausages

In the production of fish preparations, more particularly fish sausages, fish is mixed with 0·25-5% by weight of one or more salts of ortho-, pyro-, meta- or poly-phosphoric acid, to improve its texture and flavour.—743,196. *Van Hees Ges.*

Milk food product

In the production of a milk food for infants, or for therapeutic use, the acidity of acid whey is reduced without increasing its content of ionisable salts by treatment with anion exchange material. The whey is then mixed with milk, skimmed or separated milk and/or cream and subjected to concentration and canning or evaporation to a powder.—742,647. *Aplin and Barrett, Ltd.*

Carbohydrate foodstuffs

A foodstuff is produced by grinding raw potatoes to a cream, adding a cereal flour to the potato cream in an amount approximately 10 to 20% by weight of the cream solids, heating the mixture for a few minutes at 160 to 212° F., and finally drying.—742,682. *C. Goodall.*

Pasteurising liquid

A liquid such as milk or cream is pasteurised by injecting steam into the finely divided product. The hot product is then expanded at least once to a pressure value intermediate to that corresponding to the initial temperature of the product and that corresponding to the pasteurising temperature. The product is cooled by this expansion, and the steam at this intermediate temperature is used for preheating the product to be pasteurised.—742,482. *P. R. Laguilharre.*

Sausage casings

A viscose solution is extruded through an annular nozzle into a coagulant bath and the tube thus formed is inflated with air or inert gas. The inflated tube is wound around a cylinder, the cellulose regenerated while so wound, and the tube finally subjected to the usual washing, after treatment and drying procedure.—742,031. *Kalle and Co. A.G.*

Bottle crate

A crate for holding bottles, etc., includes an outer frame with a base and at least one deck of division members, two similarly shaped wires forming each member in one set of members in a deck, the members intersecting and being jointed to similar members in the other set only in the upper and lower planes of the deck to form cruciform-shaped joints.—742,115. *Ross Bros. (Ben Rhydding), Ltd.*

Coffee tablets

Particles of roasted and ground coffee are coated with a sugar substance, and the resultant mass is submitted to a rolling which transforms the coffee particles into pellicles and causes part of the coffee juice to be extruded and to be absorbed by the sugar coating, to obtain, upon a subsequent agglomeration, a compact mass in which the coffee is protected against evaporation of its juices.—742,150. *Les Gourmets S.A.*

Wrapping machine

Lowering a table automatically raises the front and rear walls of a wrapper on the table about the articles to be wrapped, and a horizontal ram displaces successive packages from the lowered table on to a rearwardly extending bed plate. The ram incorporates devices which fold the wrapper front wall over the top of the articles, and pivoted side tucking members are actuated automatically as the ram advances, prior to the rearward displacement of the partly wrapped package.—742,832. *British Sugar Corporation, Ltd.*

Dough forming machine

A device for forming a continuous sheet of dough, etc., includes three rollers mounted below a hopper. One roller has a diameter approximately twice that of either of the other two rollers, which latter are mounted, one above the other at one side of the larger roller, each leaving a gap for passage of the dough. A spacing block is located between the smaller rollers and constitutes a wall of a chamber bounded by the rollers. The axes of the smaller rollers are adjustable with respect to the larger rollers to regulate the amount of dough discharged.—742,448. *Industrie-en Handel Mij de Vuurstag C.V.*

Can filling machine

A gaseous medium such as carbon dioxide for displacing air from the head of a filled can is delivered as a flat continuous ribbon from an arcuate mesh-screened slot in a nozzle. The nozzle face in which the slot is formed is concentric with the can, and the slot extends over a third of the can circumference.—742,344. *Continental Can Co., Inc.*

Biscuit feeding machine

Biscuits are fed from the lower end of a hopper (in which they are stacked upon each other and side-by-side) in a transverse line on to a conveyor band by means of a reciprocating slide actuated by a rotary cam mechanism. The action of the slide is nullified intermittently to provide spaces between batches.—742,328. *Baker Perkins, Ltd.*

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Down-to-earth protection

MONTEZUMA, proud monarch of Mexico, like many kings before him, was forbidden to touch the ground and had to be carried about by noblemen. In the olden days, it seems, kings were thought to be charged with virtue and they had to be insulated from contact with the earth to prevent the charge running to waste.

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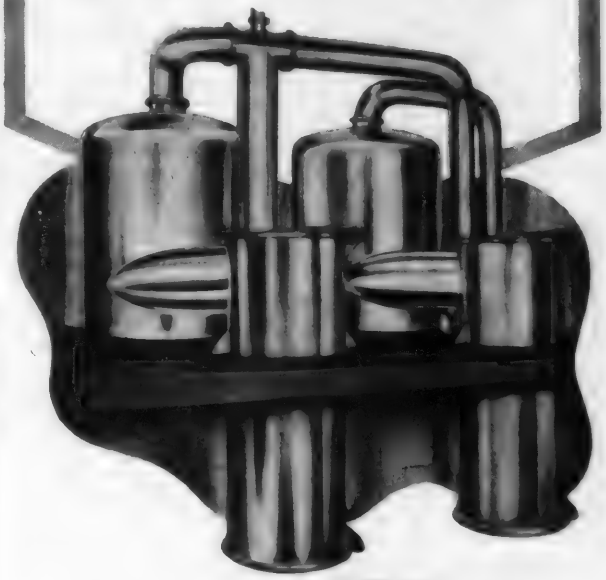

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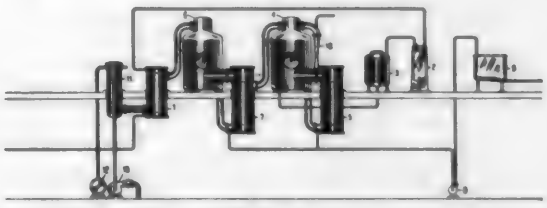

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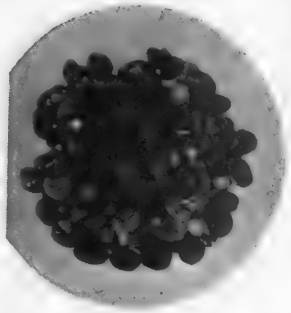

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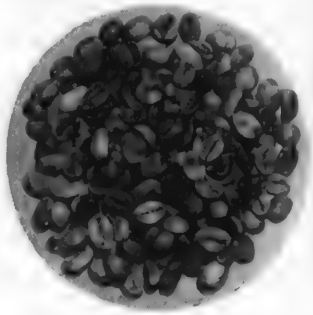

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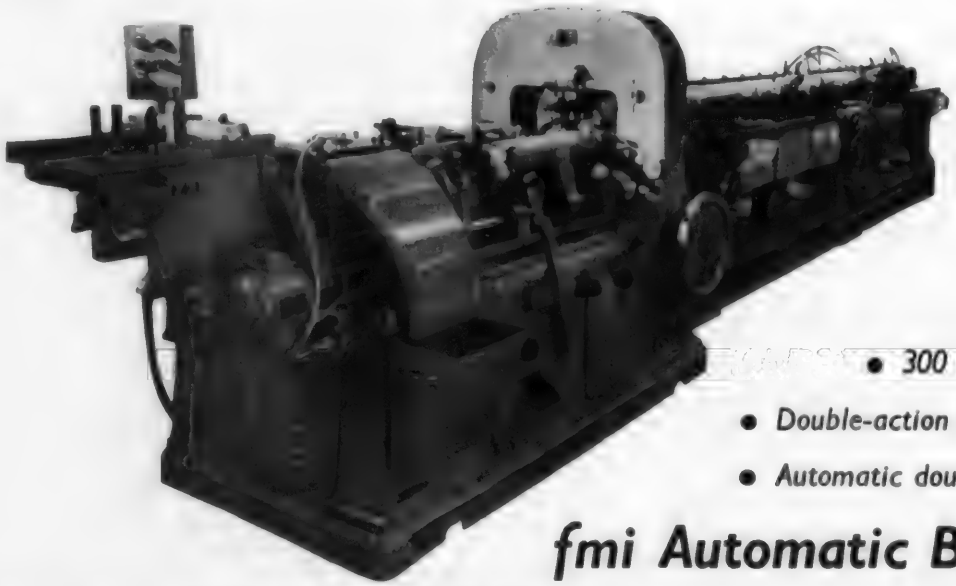

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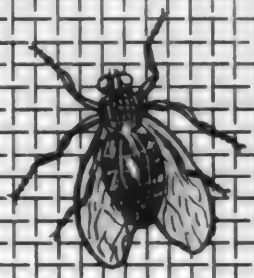

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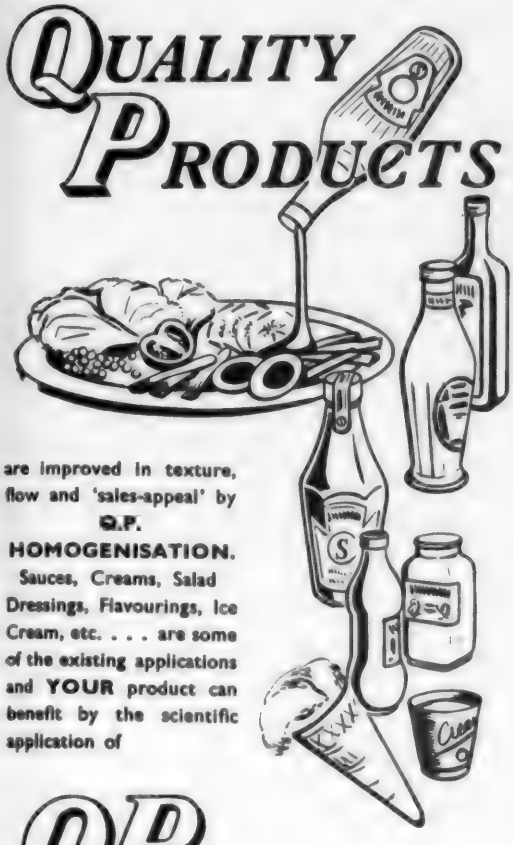

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The author's experience began at the age of twenty when he was appointed manager of coffee estates in Uganda. He was directly connected with the formation of the Kilimanjaro Native Planters' Association, now the K.N.C.U. In connection with his botanical collecting work for Kew and the British Museum he was elected a Fellow of the Linnean Society in 1928, and later, in 1930, he took charge of an Agricultural Training School. He now contributes to many journals at home and overseas, and has written several books on fibres.

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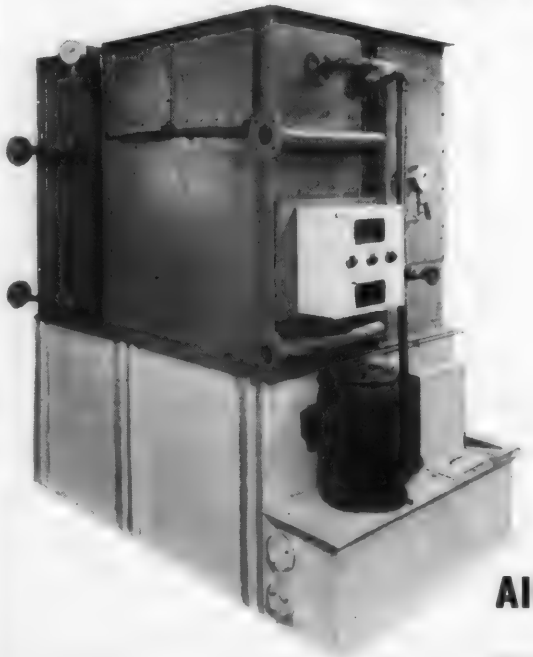

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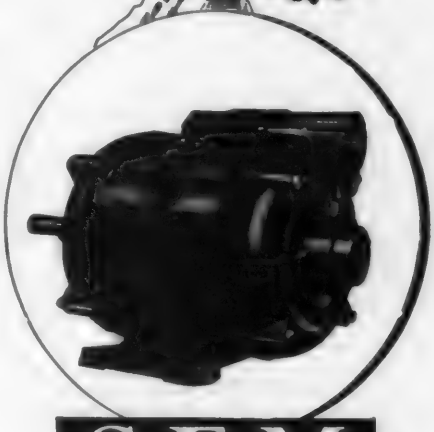

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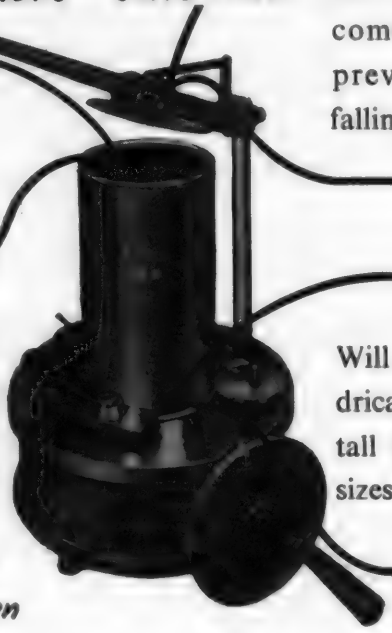

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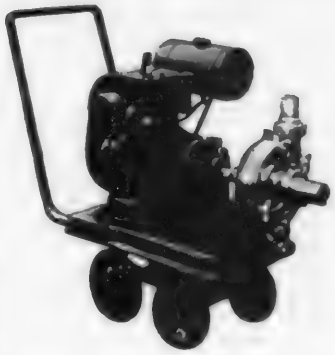

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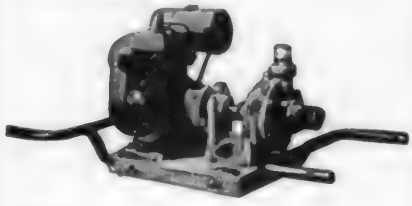

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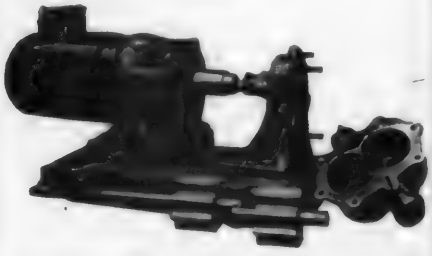

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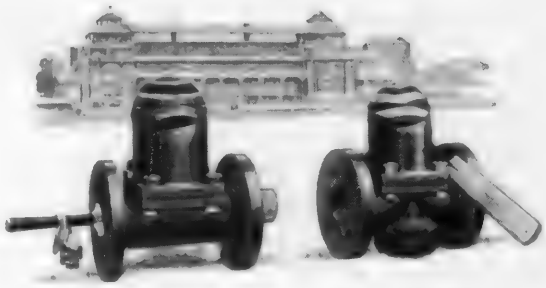

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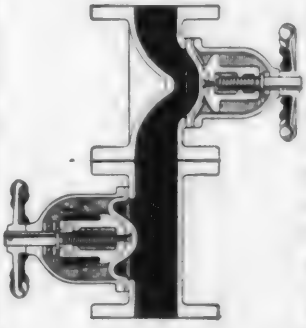

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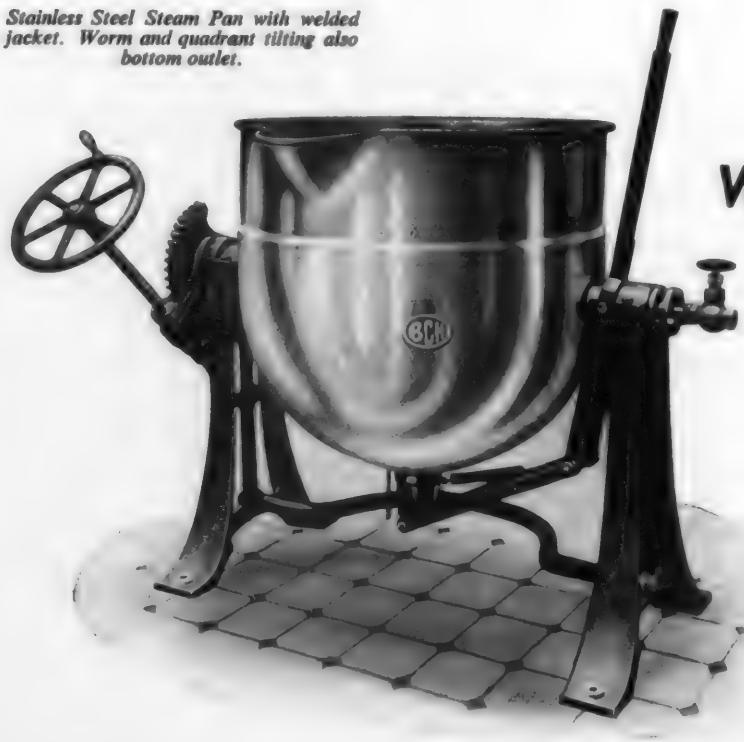

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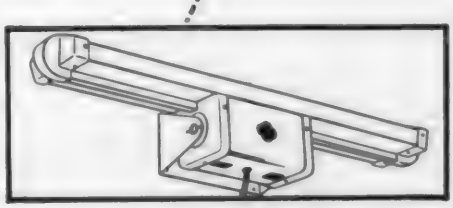

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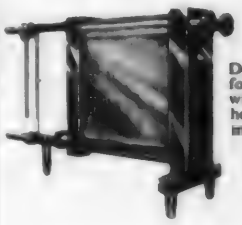

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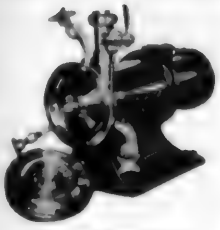

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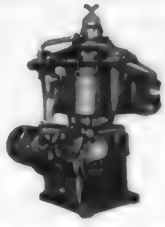

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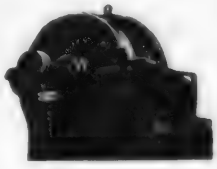

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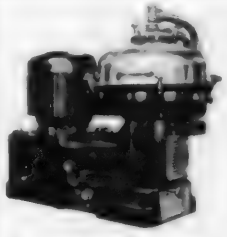

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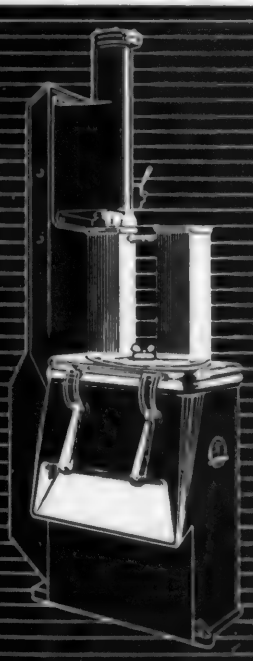

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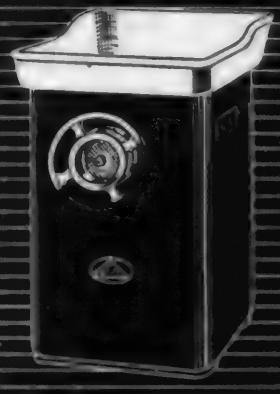

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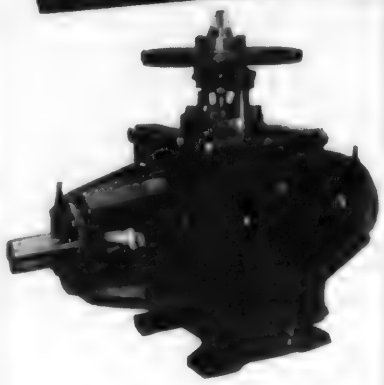

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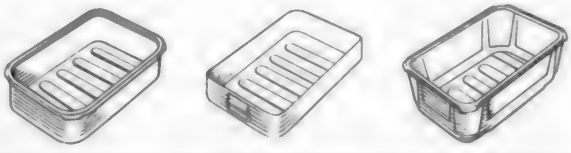

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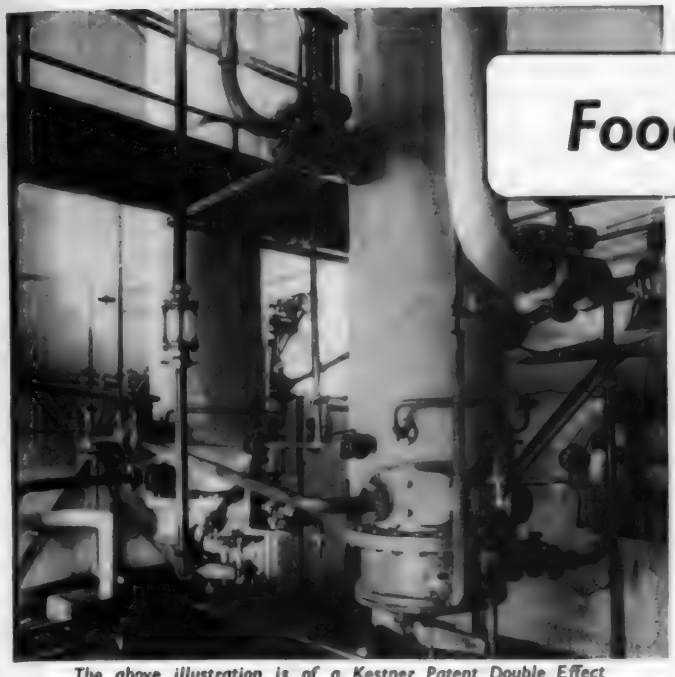

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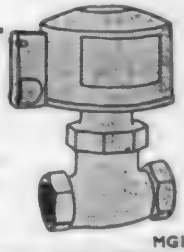

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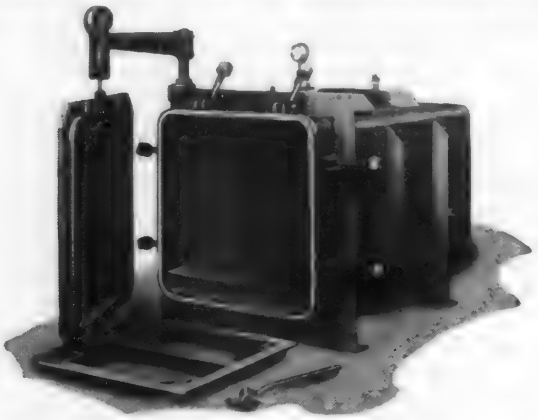

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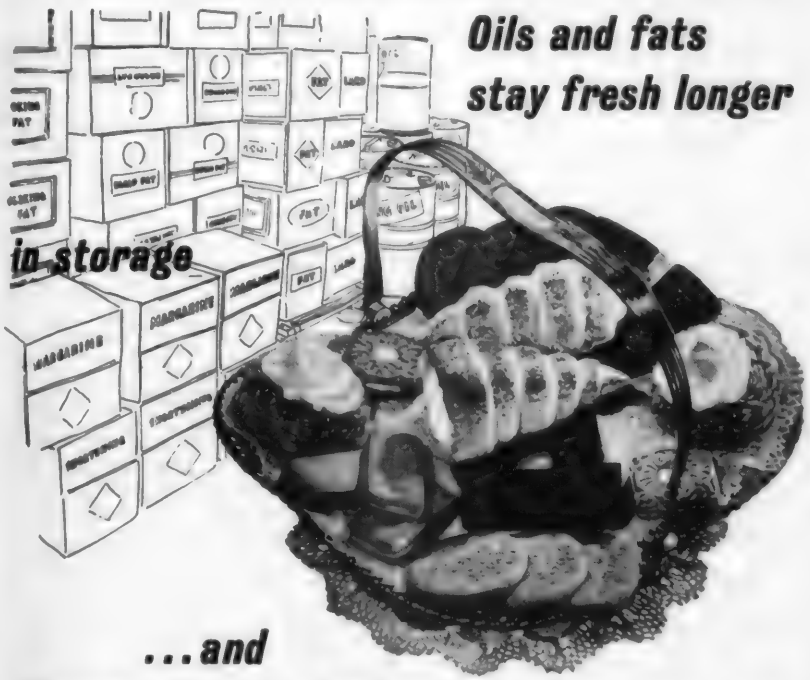

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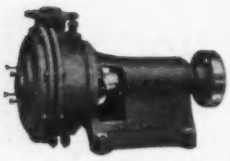

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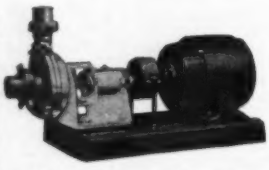

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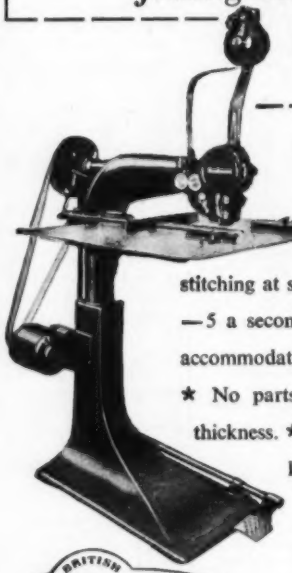

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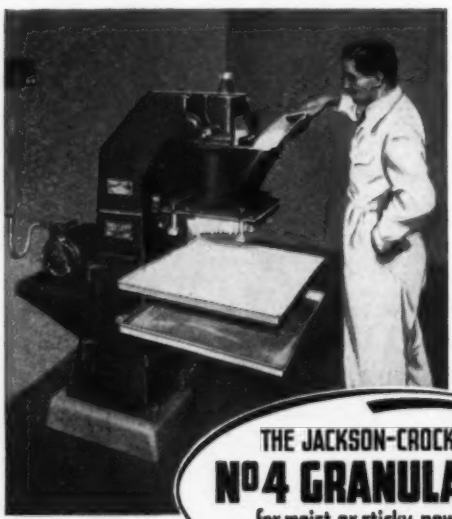

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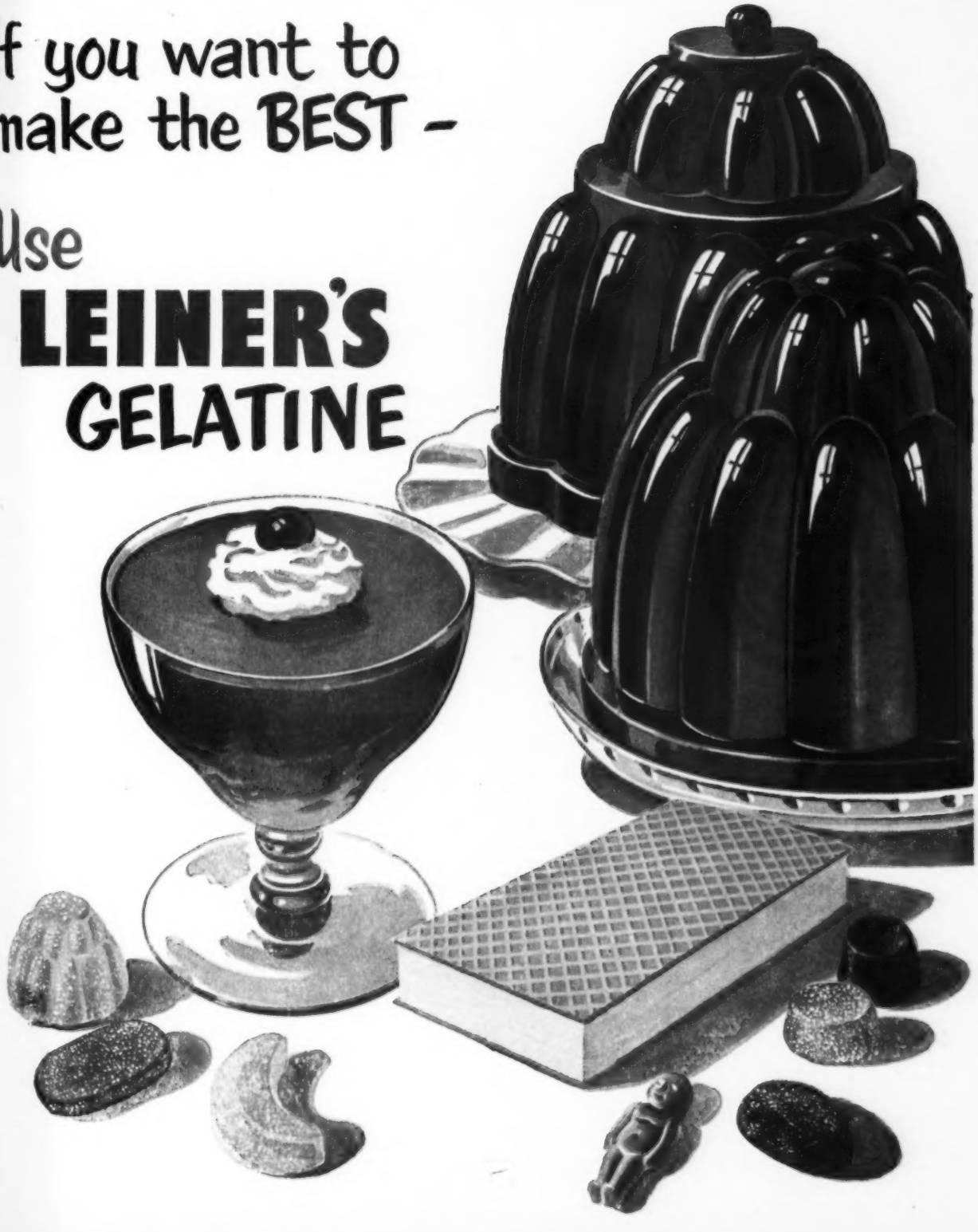

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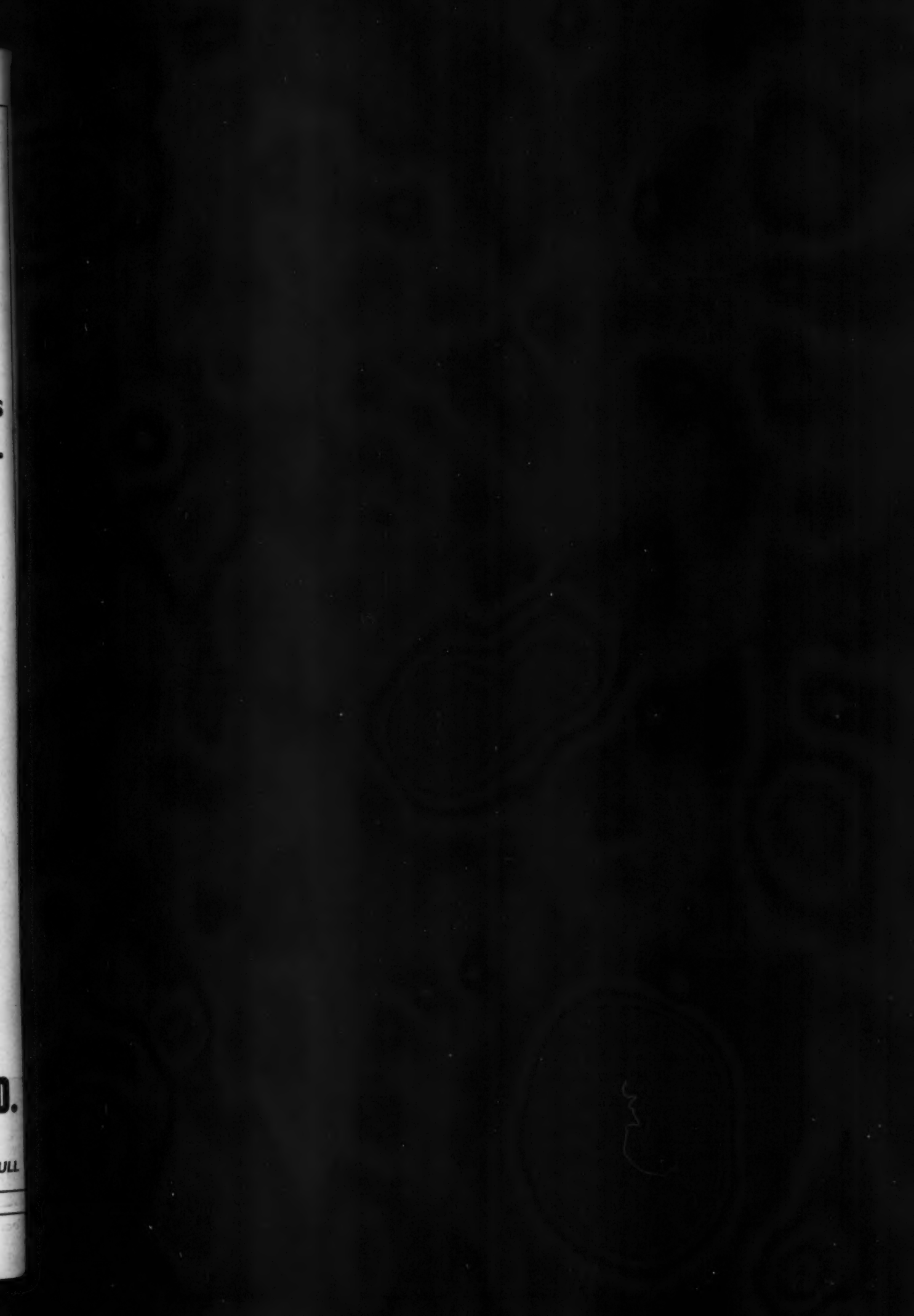
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